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Modelling and forecasting of gender mobility behaviour for pilot cities

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Abstract

Mobility policies should consider a diversified approach to achieve equitable transport and mobility solutions. Understanding the needs of all can lead to inclusive transport systems and mobility services that provide adequate services, at the right time, at the right place, supporting mobility for all genders and age groups. Personal characteristics such as gender, age, household status and income, among others, may affect mobility experiences that are expected to be safe, secure, comfortable, convenient and pleasant. In this line, the TInnGO objective is to create a framework and mechanisms for a sustainable game change in European transport through a transformative gender and diversity-sensitive smart mobility strategy.

In the TInnGO project, an intersectional approach has been adopted to analyse people's mobility experiences in 10 European Hubs: Spanish, Portuguese, French, Italian, Greek, German, Baltic, Scandinavian, UK and Romanian. 4436 replies were collected and analyzed to designate the aspects for which changes in the mobility systems are required for specific segments of society. This data is available in the TInnGO Observatory, which will act as a data repository, a platform for successful practices exchanges and a policy testing collector.

Mobility patterns, behaviours and perceptions in the 10 hubs samples are analyzed with an intersectional approach. Differences in the perceptions of men and women and age groups are pointed out. Based on the collected information, suggestions for improving public transport, pedestrian and bike infrastructure and the uptake of new technologies are provided.

Contents

Abstract	4
Publishable summary	8
1. Introduction	11
2. Methodology	12
2.1. Survey design	12
2.2. Data Collection	13
2.3. Data Analysis	14
3. Sample characterisation	16
4. Assessing mobility patterns and transport choice with an intersectional approach	21
4.1. Mobility patterns: flows, time and distance	21
4.1.1. Aggregated flows and density	21
4.1.2. Average distance and time	27
4.2. Transport choice in the most frequent journey	30
4.3. Transport choice per trip purpose	32
4.3.1. PT per trip purpose	32
4.3.2. Private vehicles per trip purpose	33
4.3.3. Walking per trip purpose	34
4.3.4. Biking (owned and shared) per trip purpose	35
4.3.5. Shared modes (car, scooter, and electric scooter) per trip purpose	37
4.4. Multi-stop trips per trip purpose	38
4.5. Travelling with dependents and transport choice	39
5. Assessing harassment experiences as travellers	40
5.1. Harassment incidents in 6 MA	40
5.1.1. Incidents and reporting per MA	40
5.1.2. Security perceptions per MA	46

5.2	Other hubs results	46
5.2.1	Baltic Hub (Lithuania, Latvia, and Estonia)	46
5.2.2	German Hub	49
5.2.3	Romanian Hub	51
5.2.4	United Kingdom Hub	52
6.	PT infrastructure and services satisfaction from a gender perspective	54
6.1.	PT Service indicators per hub	54
6.2.	PT Safety indicators per hub	55
6.3.	PT Security indicators per hub	56
6.4.	PT Infrastructure indicators per hub	57
6.5.	PT satisfaction: traveller clusters	58
7.	Private vehicles satisfaction from a gender perspective	61
8.	Active modes satisfaction from a gender perspective	63
8.1.	Walking indicators per hub	63
8.2.	Owned bicycle indicators per hub	64
8.3.	Shared modes indicators per hub	65
9.	Mobility satisfaction models with a gender perspective	67
9.1.	French hub	67
9.2.	Spanish hub	67
9.3.	Baltic Hub	68
9.4.	German Hub	68
9.5.	Portuguese hub	68
9.6.	Scandinavian Hub	68
9.7.	Other hubs	69
10.	Improvements on PT infrastructure and services from a gender perspective	70
10.1.	PT improvements: gender differences	70

10.2.	PT improvements: traveller clusters	71
11.	Intelligent Transport Systems from a gender perspective	73
11.1.	Autonomous vehicles	73
11.2.	Shared vehicles	74
12.	Conclusions and recommendations	75
12.1.	Mobility patterns from a gender perspective	75
12.2.	Harrassment experiences as travellers	75
12.3.	PT infrastructure and services from a gender perspective	76
12.4.	Improvements on PT infrastructure and services from a gender perspective	78
13.	References	79
14.	Annexes	81
	Annex I – Samples' overall statistics	81
I.1	Gender	81
I.2	Age groups	82
I.3	Type of disabilities	83

Publishable summary

Mobility policies should consider a diversified approach to achieve equitable transport and mobility solutions. Understanding the needs of all can lead to inclusive transport systems and mobility services that provide adequate services, at the right time, at the right place, supporting mobility for all genders and age groups. Personal characteristics such as gender, age, household status and income, among others, are expected to affect mobility experiences.

In the TInnGO project, an intersectional approach has been adopted to analyse people's mobility experiences in 10 European Hubs: Spanish, Portuguese, French, Italian, Greek, German, Baltic, Scandinavian, UK and Romanian. 4436 replies were collected in total and analyzed to designate the aspects for which changes in the mobility systems are required for specific segments of society.

At first, the mobility patterns of all the respondents were analyzed, and conclusions on each hub were derived. The hubs' sample's travel behaviour shows that the preference of traditional transport modes - car and public transport still prevails. The use of bicycles is not yet prevalent, and the shared modes are not widespread. Moreover, it was observed that, on average, in the datasets analysed, women travel shorter distances and take longer to arrive at their destination. Furthermore, the car is the most popular transport choice regarding respondents' most frequent journeys, with men using more private vehicles as drivers and women as passengers. Another trend observed is that women use more public transport in most samples than men. Furthermore, in most datasets analysed, the number of stops along the main journey is higher for women. Even though the gender differences in mobility are slowly closing, results show that most women make intermediate stops for shopping and men for leisure and work/study reasons. Moreover, the gap is decreasing in terms of travellers' behaviour when escorting dependents, with the data showing a more balanced responsibility between genders. Additionally, it was possible to see that both genders choose private vehicles when travelling with the dependents. Biking and PT are less preferred modes when travelling with dependents, which may be evidence of low accessibility to public transport for the vulnerable population (disabled, elderly or children).

Furthermore, the respondents' satisfaction with the transport system was assessed, and gender differences were identified. Overall, men have higher rated security aspects in public transport (PT) systems than women. The analysis indicated that women feel less secure waiting for PT while onboard and parking their cars at intermodal stations. The feeling of crowding is also different between genders, as women feel less satisfied with crowding and less safe when many people are gathered at waiting areas or onboard.

After analyzing the differences in satisfaction with public transport based on gender, an intersectional perspective was followed, and the respondents were clustered according to their replies. By clustering travellers' perceptions on current PT systems, it was noted that older people and people with dependents call for better infrastructure. On the one hand, young men seek integration in mobility services. On the other hand, young women request improvements in security aspects in the PT. The same happens with bus users and low-income travellers. These groups have lower perceptions of PT security aspects. It should be highlighted that previous negative experiences lower security perceptions significantly, plus they might impact the overall perception of the service.

Moreover, urban area residents tend to be more satisfied with PT features, while those living in rural areas tend to be overall dissatisfied. An overview of the cluster sizes demonstrates that almost nearly one-third of the respondents in the 10 European Hubs are satisfied with public transport provision. At the same time, 15% are dissatisfied with all the aspects of public transport. The rest of the respondents have specific requirements as 22% of the respondents are not satisfied with PT infrastructure – space and accessibility, 22% are not satisfied with PT integration and multimodality features, and 14% are not satisfied with PT security aspects.

Active modes were also analyzed. In the case of bike usage, the recommendations are not gender-oriented as all users require safer infrastructure and request a review of the driving culture of drivers of other modes. Furthermore, it is necessary to improve bike parking conditions, connectivity with the public transport network, cycle lanes maintenance and space to satisfy and encourage more women of all ages to use the bike.

After the assessment of current services, potential future interventions were addressed. It is observed that nearly one-third of the sample would be satisfied with the “business-as-usual” state in public transport service. Another third would like to have changes in all the levels. The other third would like to have targeted changes that would satisfy specific needs of infrastructure provision, customization in services and security.

Of all the measures accessed regarding potential future interventions, from those with statistically significant values, nearly half of the measures are related to improvements in the PT infrastructure's security and surveillance aspects; a quarter with enhancing accessibility to PT stations and stops and space onboard. The remaining one-third aimed to enhance PT services by customising fares and routes and allowing multimodality integration with other modes.

Overall, what is requested is to enhance space, comfort, security, integration, flexibility, and PT services' integration with other modes. Given the current competition that public transport faces with the advent of ride-hailing services in many European cities, on the one hand, the

introduction of flexibility in public transport can be a measure to keep its market share and satisfy user needs. On the other hand, PT operators could start working with those companies to complement the offer in places where PT infrastructure and services do not meet peoples' needs.

Some questions were analysed to complement this work and understand harassment experiences as travellers. Results are in line with literature where it is referred that sexual, theft and verbal harassment in public transport services are usually underreported. It was observed that from the six metropolitan areas (MA) analysed - Paris MA (279 answers), Turin MA (420 answers), Thessaloniki MA (231 answers), Valencia MA (442 answers), Lisbon MA (373 answers) and Malmo MA (210 answers), on average, 19% of respondents had already experienced harassment as travellers. The rates vary across the hubs, but there is evidence that the hubs that have taken measures to increase security had lower harassment rates. An interesting finding has also been that only 21% of these incidents are reported. In these six MA, the most voted reasons for underreporting are mistrusting the police and undermining the importance of the incidents. When looking at the gender distribution among the incidents, it is seen that overall, people from all age groups have experienced harassment as travellers; however, there are more harassment incidents among women than men, 17.45% and 14%, respectively. In addition, it was observed that low-income people had informed 35% of the incidents in these samples.

In general, the respondents who have had a harassment experience feel less secure onboard, at the stations and stops, and are afraid of being harassed again. Furthermore, these samples show a tendency regarding people who have experienced harassment as PT users. This group is less optimistic about the effectiveness of new measures to improve their public transport experience. Overall, only changes in the feeling of security are relevant for this segment.

1. Introduction

The TInnGO project aims to approach gender gaps in mobility and develop a framework and mechanisms to help build more sustainable and inclusive transport systems. TInnGO investigates how some transport aspects such as security, accessibility, integration, space available inside vehicles interact with different sociodemographic variables such as gender, age and income. The joint analysis of mobility behaviour and gender means that TInnGO aimed at investigating the relationships between gender and mobility in different social, cultural and geographical contexts. It should be highlighted that the 10 TInnGO hubs: French, Italian, Greek, Spanish, Baltic, German, Portuguese, Swedish, Romanian and the United Kingdom, working in close collaboration to collect mobility experiences of different groups of people in Europe. This data will be available in the TInnGO Observatory, which will act as a data repository, a platform for successful practices exchanges and a policy testing collector. The main objectives of the surveys were to identify:

- the main drivers of mobility and the “desire lines,” i.e., the most wanted connections for different groups in terms of Age, Gender, and Diversity (AGD).
- commuters’ choices, particularly women in different metropolitan areas with different transport systems.
- the effects of personal characteristics and their daily activities on the choice of transport modes, including, for example, constraints in terms of physical access to services.
- how each mode’s system affects women’s mobility behaviour;
- the perception of different AGD groups of new transport policies, technologies, and services.

By gathering the information above, the goal is to develop guidelines for sustainable gender smart mobility for policymakers and transport planners with an intersectional approach regarding Age, Gender, and Diversity (AGD), if the samples collected during the project allow it.

2. Methodology

In this deliverable, the role of the transport system in different contexts is explored. An analysis will be made of how the transport system affects individuals with different characteristics and the impact of these intrinsic characteristics on the perception and evaluation of the transport offered in the ten TInnGO hubs. The aim is to understand:

- the differences in the mobility patterns between different groups of society.
- the differences in users' perception of the quality of the mobility options available.
- to what extent does the available transport system meets vulnerable groups' mobility needs.
- the attitude of different users towards new measures/technologies in mobility.
- the main drivers of mobility for different users.

2.1. Survey design

A survey was built to explore the mobility patterns of citizens and the main factors affecting the choices of different groups in terms of Age, Gender, and Diversity (AGD). The survey was designed based on focus groups, telephone interviews, workshops conducted within the project and relevant information gathered from a literature review and outputs from European projects such as DIAMOND and METPEX. It should be highlighted that people were asked to answer the questions without COVID-19 restrictions and limitations. Disaggregated information on each user was collected using the most common journey as stated in Deliverable 7.1 of this project:

- socio-economic indicators such as gender, age, social level, education, ethnic origin, family composition, accessibility to the car.
- mobility choices, including modes used for commuting and other trip purposes, the possible alternatives, and the reasons behind the choices.
- trip characteristics, in particular, travel time for the most frequent trip (daily) and stops included.
- perception of safety and security at all trip stages - access, egress, on-vehicle.
- satisfaction levels with the transport infrastructure. For instance, lighting status of paths to transport stops, bus vehicle design friendliness for kids' trolleys, amongst others.
- satisfaction levels regarding the mobility service such as connectivity and service reliability.

- intention to use new mobility services that could enhance accessibility to the existing public transport network, in particular, shared services with autonomous vehicles.
- perception of specific features included in transport systems to increase safety and security. For example, using operators' applications to communicate security risks on-vehicle.

2.2. Data Collection

On the one hand, information was gathered regarding each metropolitan area's transport network and services, regarding travel costs per origin/destination, types of tariffs (day-ticket, monthly passes, amongst others) and existing discounts for specific groups. Additionally, complementary activities occurred in Work Package 3 that assisted in analysing the dataset from each hub, namely virtual workshops, meetings, and conferences to analyse the behaviour of transport users in the ten TinnGO hubs using an intersectional approach.

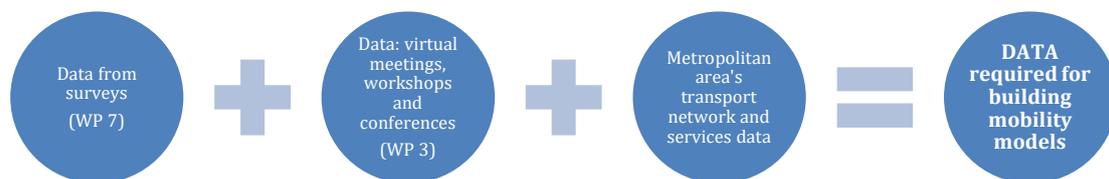


Figure 1 Input data for mobility needs

On the other hand, due to the COVID-19 pandemic, data was primarily collected through web-based survey dissemination campaigns through TinnGO and hubs' social media channels, platforms, and networks during the following periods (see Table 1). Even though online surveys are easily created and distributed, it should be highlighted that a combination of distribution methods should be used to have age, gender, and diversity (AGD) samples. The aim was to reach a minimum of 400 responses per hub and that the data collected was statistically representative of the population above 18 in those metropolitan areas/regions/countries analysed. Nevertheless, due to the COVID-19 pandemic, the data collection was postponed several times, and the data received from some hubs were not statistically representative, thus could not be used as intended. Potential participants were overwhelmed by the number of online surveys and events happening during the pandemic. Therefore, to increase the number of completed surveys, some hubs offered prizes for participation or subcontracted specialised companies to overstretch participants' willingness. In this context, hubs that used only social

media channels with or without incentives had fewer data from older (>80 years) and disabled people and less balanced gender datasets, not in line with each metropolitan area/region/country demographics.

TInnGO hubs	Number of replies	Data collection period
Baltic	440	22/04/2021 – 12/05/2021
German	414	22/04/2021 – 12/05/2021
Greek	401	26/12/2020 – 03/02/2021
Italian	421	21/12/2020 - 27/12/2020
French	400	14/12/2020 – 18/12/2020
Portuguese	400	22/04/2021 – 12/05/2021 (90) 29/07/2021 – 30/07/2021 (310)
Romanian	527	08/2020 – 06/2021
Spanish	442	23/12/2020 – 04/01/2021
Scandinavian	412	14/12/2020 – 22/01/2021 12/02/2021 – 22/03/2021
United Kingdom	579	01/12/2020 – 30/01/2021 (29) 01/08/2021 20/08/2021 (550)

Table 1 Data collection: answers and timeframe for each hub

2.3. Data Analysis

Before analysing and employing the data following an intersectional perspective, it was necessary to explore the collected data regarding the main factors influencing mode choice, mobility behaviour and perceptions of different agents, thus in:

- Step 1: information was collected to depict the user's profile through a web-based survey disseminated in social media channels, platforms, and networks.
- Step 2: mobility patterns and behaviours and the transport offer were analysed. In this stage, GIS techniques were primarily used to validate data, to assess and characterise the samples' most frequent trips. The validated answers were geocoded through GIS techniques. At the same time, the representation of aggregated flows for the most common journeys was carried out by joining the geocoded origins and destinations, zoning the territory, and quantifying the trips between each pair of zones. Users' sociodemographic variables such as age, gender, and ethnicity (when available) were used to assist in the validation process of the samples. Additionally, in this stage statistical tests such as two independent samples T-test, ANOVA, Mann-Whitney, and Kruskal-Wallis were conducted to determine which variables influence each agent in their daily mobility and users' perceptions were modelled through SPSS.

- Step 3: information was collected to characterize harassment incidents in the samples. Firstly, data were validated, and afterwards, Python code and GIS software were used to extract the harassment act locations' coordinates in the cases when respondents agreed to indicate the location of the places where they were harassed. The geocoded harassment points were mapped, while the hot spot analysis allowed identifying the most critical areas. Additionally, this stage included statistical analysis.
- Step 4: users' satisfaction levels with existing transport services were analysed. In this section, customer satisfaction questions using a 5-point Likert scale were employed to evaluate transport infrastructure and mobility services' satisfaction levels regarding the transport mode used in the most frequent journey. The data collected in this section helped identify user satisfaction levels', determinant aspects and how these vary in gender and age within the ten European samples. Due to the lack of sufficient replies from non-binary and transexual respondents, only answers from men and women were analysed. This section also explored the passenger experience focusing on the perceptions regarding security aspects, integration, space availability, public transport services and infrastructure characteristics due to their relevance to mode choices. Additionally, this stage included statistical analysis as well as users' perceptions modelling through SPSS.
- Step 5: users' perceptions of new transport services, tools and policies were studied, and new mobility services were explored. This part allowed to gather new knowledge to support operators in successfully improving their mobility offers to users. In this stage, factor analysis was used to explore agents' perceptions on the introduction of new technologies and services in the transport system of each hub. This final step aimed to understand perceptions associated with technological innovations related to smart mobility.

3. Sample characterisation

The data was collected in the Baltic states (Estonia, Latvia, and Lithuania), France, Germany, Greece, Italy, Portugal, Romania, Spain, Scandinavia countries (Denmark, Norway and Sweden) and the United Kingdom, illustrated in Figure 2.



Figure 2 Location of the four hubs in analysis

In this context, some metropolitan areas/regions/countries had more representativity in the samples in each hub, as observed in Table 2.

TInnGO hubs	The majority of the participants were living in:	Answers from the total samples
Baltic	Vilnius district	91 from 440
German	Western Thuringia Region	80 from 414
Greek	Thessaloniki Metropolitan Area	231 from 399
Italian	Turin Metropolitan Area	421 from 421
French	Paris Metropolitan Area	279 from 400
Portuguese	Lisbon Metropolitan Area	373 from 400
Romanian	Alba Iulia Metropolitan Area	254 from 527
Spanish	Valencia Metropolitan Area	389 from 442
Scandinavian	Malmö Metropolitan Area	210 from 412
United Kingdom	Birmingham Metropolitan Area	242 from 579

Table 2 Data collection: representativity for each hub

As observed in Table 2, regarding the two hubs that involved more than one country, the Baltic and Scandinavian hubs, the Baltic sample obtained more representativity from the Vilnius district in Lithuania and the Scandinavian sample from the Malmö metropolitan area (MA) in Sweden. Regarding gender desegregation, respondents could choose between men, women, non-binary and transexual. However, due to the lack of sufficient replies from non-binary and transexual respondents, statistical analysis will only capture differences between women and men.

In the **Baltic hub's** sample, 72,05% of the respondents live in Lithuania, while 12,50% live in Latvia and 15,45% in Estonia. In the Baltic dataset, men represent 50,45% of the population whilst women constitute 49,32%, as shown in Annex I. In terms of age, the analysis shows a high percentage of young population (18-34 years old) with 44,09%, in contrast with a lower percentage of old population ratio (+65 years old) with 3,18% (see Annex I). Regarding the other age groups, people between 34 and 44 years old represent 20,23% of the sample, between 45- and 54-years old account 18,18%, between 55 and 65 years old constitute 14,32%. As shown in Annex I, there are no responses registered for the older age group onwards (+75 years old).

The **French hub** focused on the **Paris Metropolitan Area (MA)**. In this dataset, women count for 53% of the total sample in this sample, as shown in Annex I. In this context, it should be highlighted that in Paris MA, foreigners represent 18,5%, which is a high rate compared with national numbers that report 6% of non-french citizens. Regarding the distribution by age, the elderly population represents 16,7%, the adult one 66,7%, while the young group has a lower weight of 16,6% (Malandrino, C. and Berman, L., 2020). The sample collected reflects this, as 15% of people are over 65 years old, 12% has between 18 and 24 years old, and 75% are between 25 and 64 years old. Regarding gender distribution, the sample is also in line with men representing 47% of the sample and women 53% (see Annex I).

In the **German Hub's** sample, the percentage of women (50,00%) is higher than men (48,79%), as shown in Annex I. The weight of the young population (18-34 years old) is 39,13%, while the old population (+65 years old) represent 29,47%. In the sample gathered for this hub and analysed in this report, the age groups between 35 and 44 years old represent 16,18%, between 45 and 54 years old constitute 15,22%, and between 55- and 64-years old account 12,56%. In this line, the greater longevity population (+65 years old) is reflected in a more significant relative presence of men (10,63%) than women (6,28%), as can be observed in Annex I.

The **Greek hub** focused on the **Thessaloniki metropolitan area**. In this sample, women represent 55.14% and men 44.86% (see Annex I). This dataset does not represent the older population, with 0% above 65 years old. People between 18 and 24 represent 10% of the sample, and 90% have between 25 and 64 years old, as shown in Annex I.

The **Italian hub** focused on the **Turin Metropolitan Area**. In this sample, women represent 49,29% of the population whilst men 50,71%, as shown in Annex I. In terms of age, the city follows the national tendency, thus registering a high percentage of the elderly population (26,4%), in contrast with a lower young population ratio - 16% (CIVITAS, 2020). This information is in line with the sample, as in the sample, women represent 51% and men 49%. Regarding the variable age, people between 18 and 24 years old represent 7% of the sample, between 25 and 64 years old correspond to 78%, and above 65 years old are 15% of the sample (see Annex I).

The **Portuguese hub** covered **Lisbon Metropolitan Area**. In this sample, women represent 50,46%, and men constitute 48,92% (see Annex I). In this case, the survey was mostly responded by men in the age group between 35 and 64 years old (29,60%); followed by women in the age group between 18 and 34 years old (23,05%) and with a less focus on men of older group onwards (+65 years old/5,61%), as shown in Annex I.

In the **Romanian hub's** sample, women represent 55,60% and men 43,64% of the total, as shown in Annex I. The weight of the young population (18-34 years old) is 27,90%, while the old population (+65 years old) represent 14,06%. In this sample, the age groups between 35 and 44 years old represent 27,89% and between 45 and 54 years old constitute 17,08% of the total sample. The age group between 55- and 64-years old accounts for 12,14% of the total. Thus, in this dataset, the young and adult group had a greater weight than the elderly population (see Annex I).

In the **Scandinavian hub's** sample, the percentage of men is 52,18%, and the percentage of women is 45,63% (see Annex I). The age distribution is similar for both genders, focusing on the age group between 45 and 64 years old with 43,50% with a similar percentage for the people between 18 and 44 years old (39,32%). People above 65 years old represent 17,23% of the total sample. Thus, regarding age distribution, the young and adult group has a greater weight than the elderly population (see Annex I).

The **Spanish hub** focused on the **Valencia Metropolitan Area**. In this dataset, women represent 52,5% and men 47,5%, as described in Annex I. The weight of the younger population is 16,4%, while the population over 65 years represents 20,7%. In addition, the greater longevity of the female population is reflected in a more significant relative presence of women over 65 (19%) than men (14%). In the sample collected in Valencia and analysed in this report, the two genders, men and women, are equally distributed; people between 18 and 24 years old represent 13% of the sample, above 65 years old 19%, and between 25 and 64 years old 68% as shown in Annex I.

In the **United Kingdom hub's** sample, the percentage of men in the overall sample is 65,44%, and the percentage of women is 34,26% (see Annex I). Thus, a very unbalanced dataset in terms of gender, when compared with the others and not representative of the demographics of the West Midlands region. 36,61% of the participants were men in the age group between 35 and 64 years old, followed by women between 18 and 44 years old (23,83%). Women above 65 years old represented only 5,01% of the sample, as shown in Annex I.

Regarding the level of education of the samples, the predominant groups are participants with bachelor and master's degrees in the Greek sample. Also, in the Scandinavian, Portuguese, Romanian, Baltic and UK's samples, bachelor and master's degrees are predominant. For the Scandinavian sample, the predominant groups are bachelor's and master's degrees with 50,24%, followed by 23,06% of respondents with upper and post-secondary education. In the Portuguese sample, the predominant group has bachelor or master's degrees (58,20%), followed by upper and post-secondary education (28,48%). The predominant groups hold bachelor and master's degrees (64,63% - highest % of all hubs) for the Romanian hub, followed by 21,99% with post-secondary and short-cycle tertiary education. The Baltic Hub's predominant groups have bachelor's or master's degrees (49,32%), followed by 38,86% (higher than others) with upper and post-secondary education groups. Similarly, in the UK sample, the predominant groups hold bachelor or master's degrees (41,75%), followed by 42,11% of participants with upper and post-secondary education.

In contrast, both Italian and German hubs' samples have a high percentage of the population with upper secondary and lower secondary education. 55% of the Italian participants have an upper secondary and lower secondary education (highest % of all hubs), and only 27% hold a master's degree. In the German sample, 41,06% of the respondents have an upper and post-secondary education, and only 29.23% have a bachelor or master's degree. In the French and Spanish hubs, the samples have a similar distribution. For example, upper/secondary education categories represent 19% and 14%, participants with a degree are 15% and 33% of the samples, and respondents with a master's degree are 23% and 13% of the datasets, respectively.

Regarding the distribution by working status, the predominant class in all hubs is - paid employment and working in an office/plant, corresponding to half of the samples' participants: Romanian hub - 55,26%, French hub - 52%, Scandinavian hub - 51,70%, UK hub - 49,82%, Baltic hub - 46,59%, Italian hub - 46%, German Hub - 45,41%, Portuguese hub - 43,65%, Spanish hub - 43% and Greek hub - 42%. The percentage of retired people is also relevant in the: French and Spanish hubs with 19%, Italian hub with 16%, German hub with 17,15%, Scandinavian hub with 15,05%, and Romanian hub with 13,77%. The percentage of unemployed people is equal in the

Greek and Spanish samples (9%) and similar to the Baltic sample (8,64%). In contrast, only 5,57% of the respondents were unemployed in the Portuguese sample, while values were lower than 5% in the German and Scandinavian datasets.

The Portuguese sample has the highest percentage of self-employed people with 15,17%, followed by the Greek, Italian and Baltic samples with 13%, 11% and 9,77%, respectively. The lowest percentages of interviewees with their own business, trade, or profession were observed in the German and Scandinavian samples with 5,8% and 2,91%, respectively.

As expected, the pandemic resulted in higher percentages of participants working remotely, with higher levels in the UK with 18,42%, followed by the Portuguese and Baltic samples with 16,72% and 13,41%, respectively. Additionally, statistical analysis of the datasets showed that the students' population is higher in the German Hub (13,53%), followed by the Scandinavian, Baltic, and Portuguese hubs with 8,74%, 7,05% and 6,81%, respectively.

It should be highlighted that the pandemic restrictions, the dissemination strategies and the tools and methods used to collect data by the hubs affected the heterogeneity of the collected sample, especially in terms of age, gender, and diversity – different social and cultural backgrounds, people with disabilities, amongst others. In this context, some hubs manage to reach different types of people with disabilities by hiring specialised companies, which is important for understanding how the transport system responds to this group of people in all hubs. The samples' analysis shows that the main disabilities registered are vision, mobility, severe long-term illness, and hearing. In contrast, their weight is low concerning learning and speech and communication disabilities. These results provide a better understanding of how the transport systems should respond to these vulnerable groups. For further details on these statistics, see Annex I.

4. Assessing mobility patterns and transport choice with an intersectional approach

This chapter aims to provide an overview of the mobility patterns and trips characterisation with an intersectional approach of the 10 TInnGO hubs, highlighting the main differences between men and women on the most frequent journey pre-COVID-19, without restrictions or limitations associated with the pandemic.

4.1. Mobility patterns: flows, time and distance

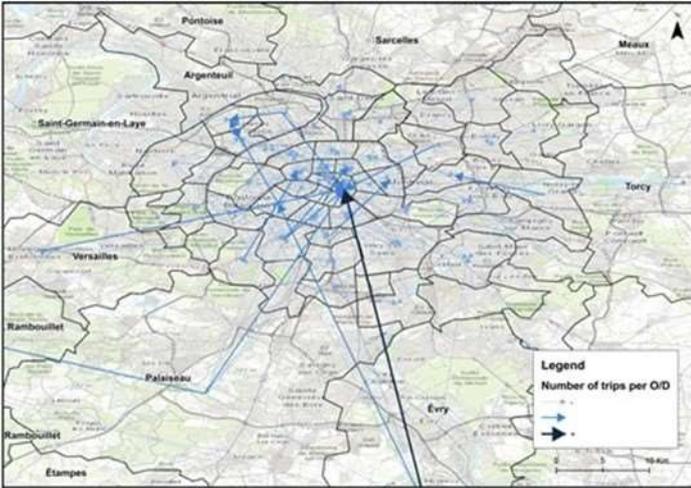
This subchapter analyses the aggregated flows and density from the 10 TInnGO hubs samples to reveal the most important Origin/Destination (OD) flows and dominant trends. Table 3 shows the number of responses collected for each hub and the number of validated responses used in this subchapter, according to mobility patterns criteria, that is, the ones including valid locations of the origin/destination of people's most frequent journeys.

Hubs	Collected responses	Validated answers
Baltic	440	380
French	400	279
German	414	314
Greek	401	231
Italian	421	421
Portuguese	400	373
Romanian	527	254
Spanish	442	389
Scandinavian	412	210
United Kingdom	579	439

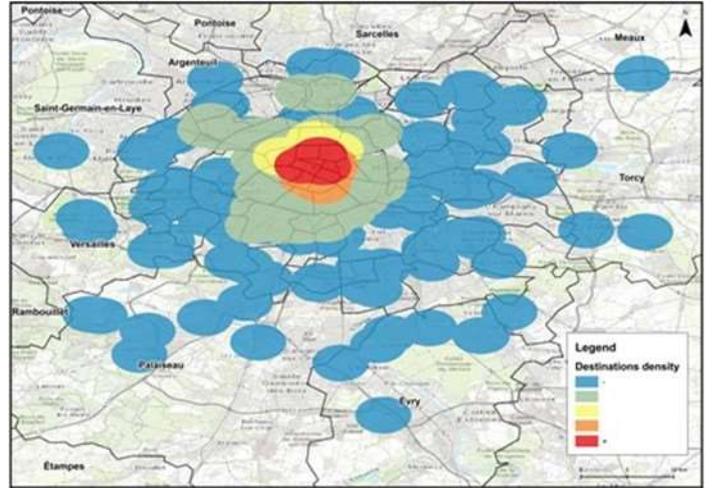
Table 3 Number of responses collected and validated for each hub

4.1.1. Aggregated flows and density

The following maps (see Figures 3 to 7) represent the aggregated flows from the French, Italian, Greek, Spanish and Portuguese samples, focusing on datasets in Paris MA, Turin MA, Thessaloniki MA, Valencia MA and Lisbon MA, respectively. An aggregation of flows towards the city centre has been observed for each metropolitan area under analysis.

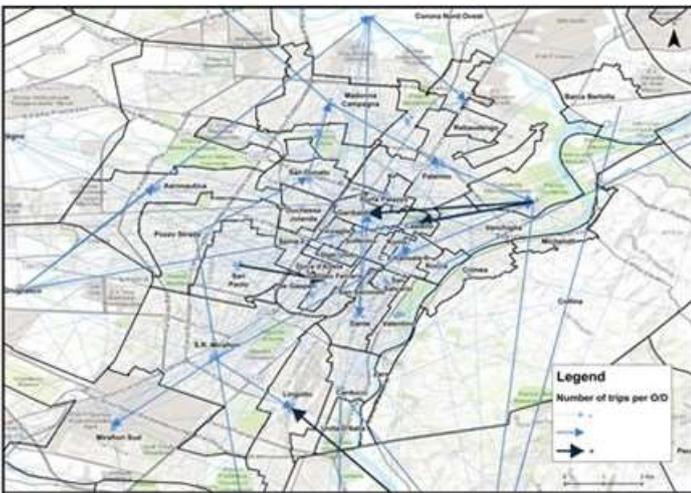


a) Aggregate flows

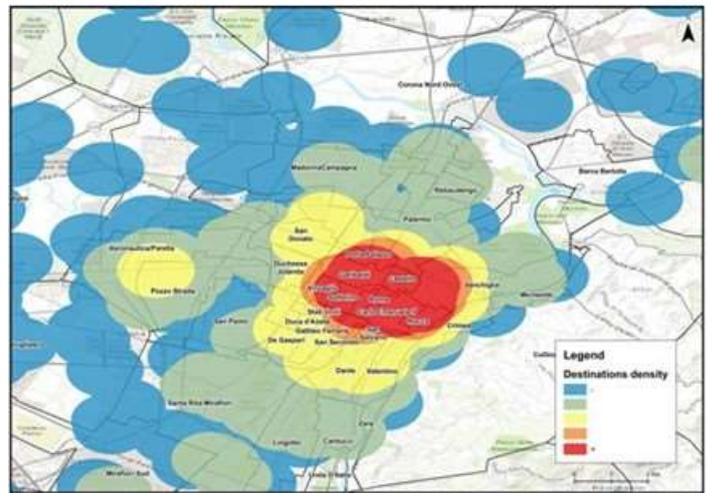


b) Density of destination locations

Figure 3 (a) Aggregate flows for the most common journey in French hub – Paris MA; (b) Density of destination locations for the most regular journey in the Paris MA

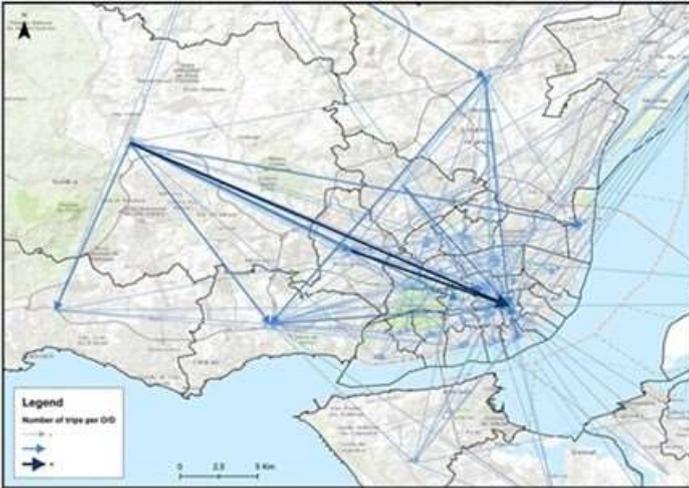


a) Aggregate flows

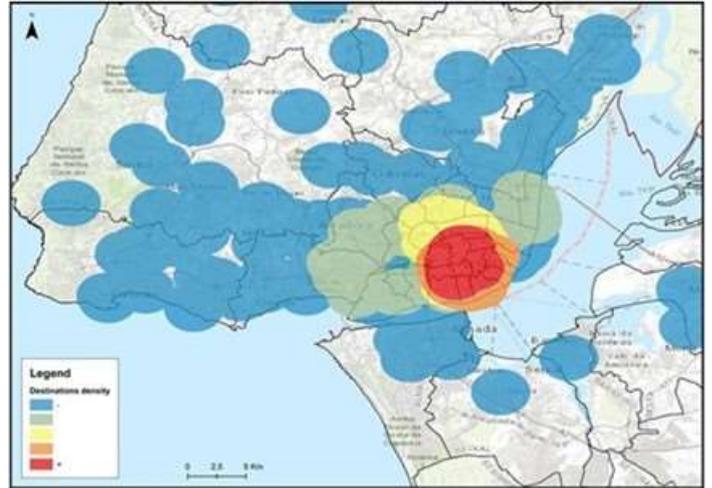


b) Density of destination locations

Figure 4 (a) Aggregate flows for the most common journey in Italian hub - Turin MA; (b) Density of destination locations for the most regular journey in Turin MA



a) Aggregate flows



b) Density of destination locations

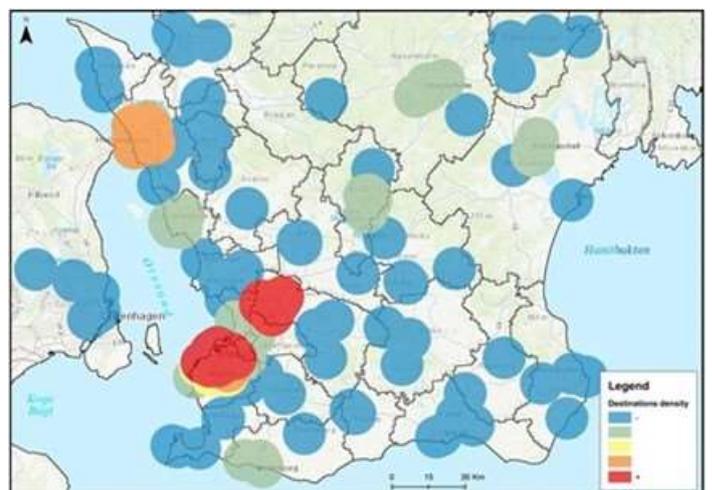
Figure 7 (a) Aggregate flows for the most common journey in the Portuguese hub – Lisbon MA; (b) Density of destination locations for the most regular journey in the Lisbon MA

The following maps (see Figures 8 to 13) represent the aggregated flows for Scandinavian, Romanian, UK hubs samples. The German hub dataset did not allow to find a clear behaviour of the respondents' flows because data was widespread across Germany. In this case, it was not possible to observe high-density O-D flow distribution and thus, maps from this dataset are not presented.

Regarding the Scandinavian sample, most of the information was collected from the Skane District for the Scandinavian sample. It is possible to observe important OD flows towards the city centre of Malmö, followed by Lund and Helsingborg, as shown in Figure 8.



a) Aggregate flows



b) Density of destination locations

Figure 8 (a) Aggregate flows for the most common journey in the Scandinavian hub - Malmö MA; (b) Density of destination locations for the most regular journey in Malmö MA, Lund and Helsingborg

In the Romanian sample, respondents' most frequent journeys were located in Alba Lulia MA. Therefore, it was possible to determine an important aggregation of flows towards the city centre, as shown in Figure 9.

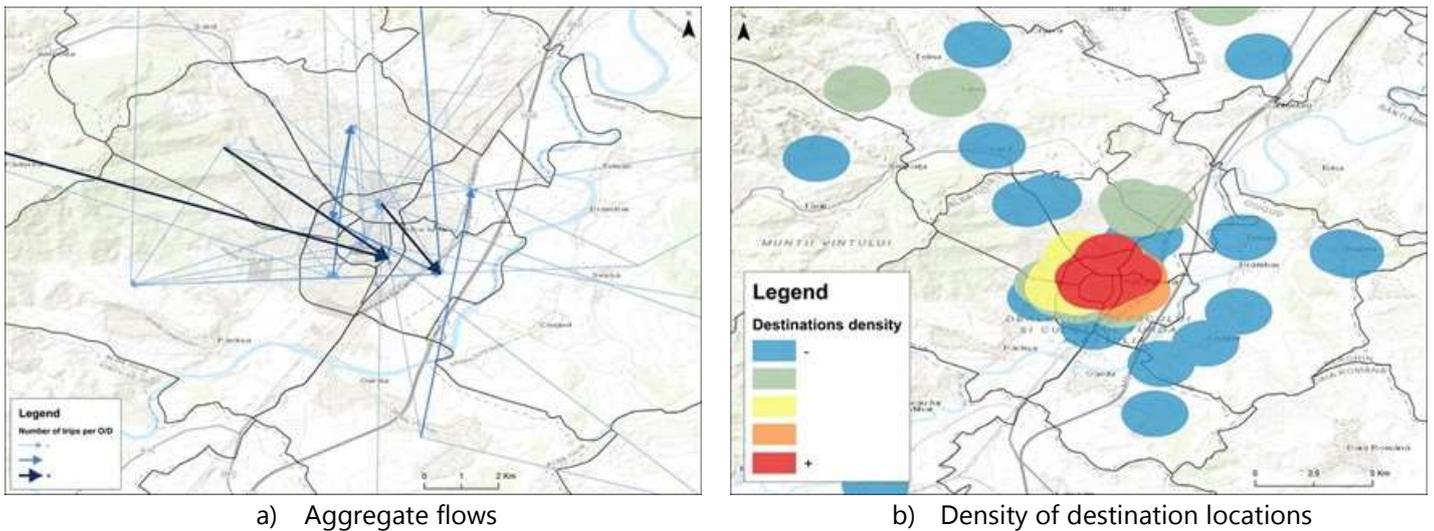


Figure 9 (a) Aggregate flows for the most common journey in the Romanian hub – Alba Lulia MA; (b) Density of destination locations for the most regular journey in Alba Lulia MA

In the United Kingdom Hub dataset, information was collected in the West Midlands Region focusing on Birmingham MA; therefore, respondents' flows can be observed in Figure 10 towards the city centre of Birmingham.

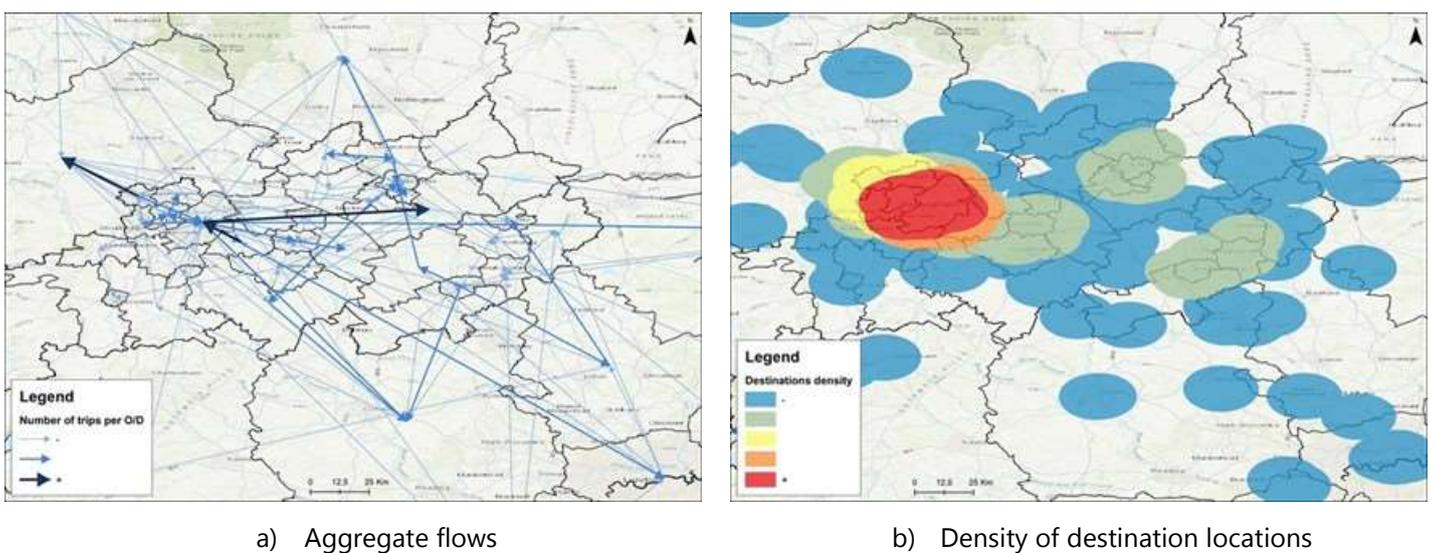
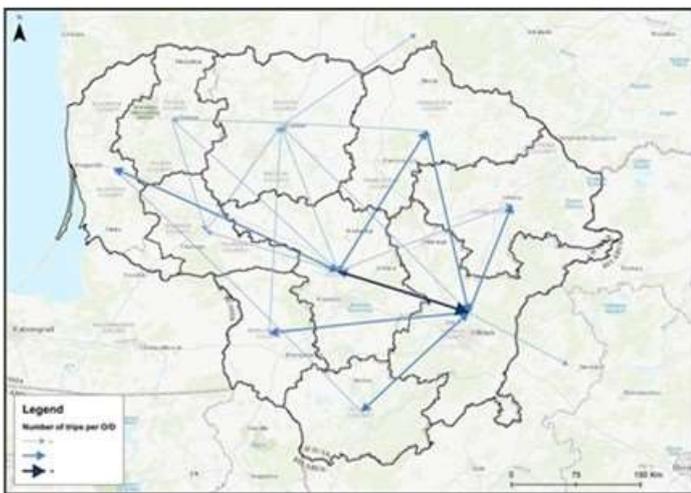
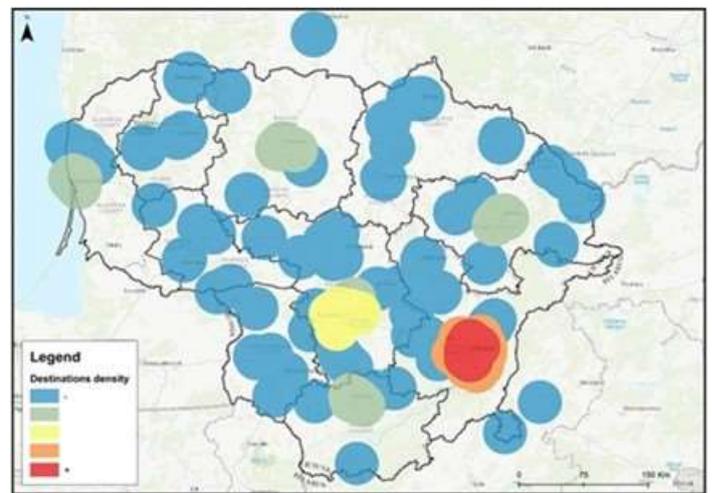


Figure 10 (a) Aggregate flows for the most common journey in the UK sample; (b) Density of destination locations for the most regular journey in the UK sample

The dataset of the 3 Baltic states (Lithuania, Latvia, and Estonia) did not allow to find a clear behaviour of the respondents' flows because there was not enough data for just one metropolitan area or city. Therefore, it was decided to analyse each country's aggregated flows. In the case of Lithuania - in Figure 11, most OD flows are going towards Vilnius city centre.



a) Aggregate flows



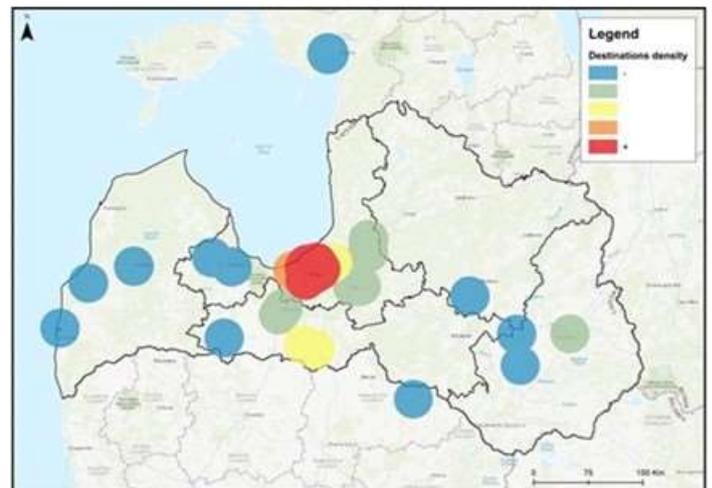
b) Density of destination locations

Figure 11 (a) Aggregate flows for the most common journey in the Baltic Hub – Lithuania (Vilnius); (b) Density of destination locations for the most regular journey in Lithuania

In the case of Latvia, OD flows are heading towards Riga, as seen in Figure 12.



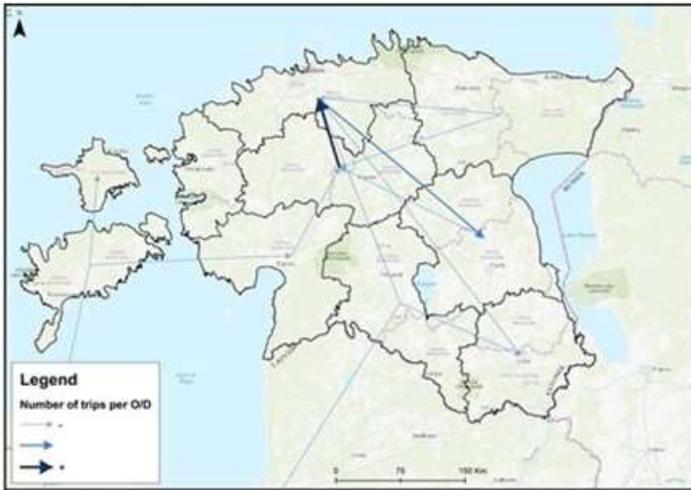
a) Aggregate flows



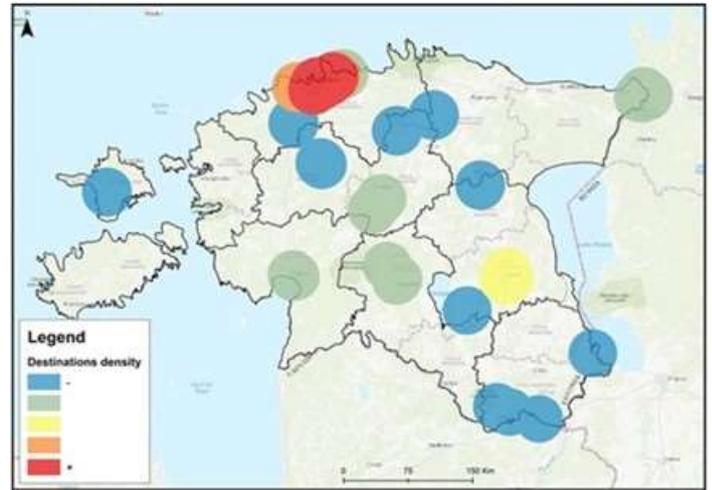
b) Density of destination locations

Figure 12 (a) Aggregate flows for the most common journey in the Baltic Hub – Latvia (Riga); (b) Density of destination locations for the most regular journey in Latvia

Figure 13 shows the aggregate flows in Estonia, which the most important flows are going towards Tallin city centre.



a) Aggregate flows



b) Density of destination locations

Figure 13 (a) Aggregate flows for the most common journey in the Baltic Hub – Estonia (Tallin); (b) Density of destination locations for the most regular journey in Estonia

The German hub dataset did not allow to find a clear behaviour of the respondents' flows because data was widespread across Germany; there was not enough data for just one metropolitan area. In this case, it was not possible to observe high-density O-D flow distribution and thus, maps from this dataset are not presented.

4.1.2. Average distance and time

Regarding average distance and time travelled in the most frequent journeys by gender and age, Table 4 and Table 5 present the results from 5 datasets that focus on metropolitan areas – Paris MA (France), Turin MA (Italy), Valencia MA (Spain), Thessaloniki MA (Greece) and Lisbon MA (Portugal). Regarding the average distance of these 5 datasets, it is possible to see some trends. On the one hand, working-age men in the age groups between 35 and 64 and over 75 years old travel longer distances than women. In contrast, young women between 18 and 25 years old travel longer distances than young men.

Average distance (Km)	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
18-24 years	10	12	6	9	8	6	9	9	9	18
25-34 years	11	11	12	7	6	6	14	12	15	20
35-44 years	16	13	15	6	11	6	14	11	20	25
45-54 years	13	10	10	6	10	7	11	10	22	21
55-64 years	17	15	8	7	12	8	14	8	19	10
65-74 years	7	5	4	3	12	4	-	-	18	3
>75 years	4	0	1	4	13	32	-	-	20	-
Average	11	9	8	6	10	10	12	10	18	16

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 4 Average distance travelled in kilometres by age and gender per hub

Regarding average time travelled by respondents in these 5 datasets (see Table 5), in the French and Spanish samples, men take more time than women in their most frequent journey in almost all age groups. There is no clear trend in the Italian dataset, as younger women take on average 40 min and younger men take approximately half of it - 25 min to work/school, but in the age group between 25- and 34 years old, men take longer than women, and no significant differences were found between 35 and 74 years old.

Average time (MM)	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
18-24 years	27	23	25	40	24	27	41	40	26	30
25-34 years	21	25	36	29	27	24	30	33	28	34
35-44 years	24	18	25	26	27	23	23	29	29	35
45-54 years	22	21	27	24	24	24	21	27	27	29
55-64 years	21	20	23	27	32	21	33	30	31	27
65-74 years	20	25	29	27	26	22	-	-	35	15
>75 years	27	20	27	35	23	20	-	-	22	-
Average	23	22	27	30	26	23	30	32	28	28

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 5 Average time travelled in kilometres by age and gender per hub

Evidence in the Greek and Portuguese samples show that working-age women between 25 and 54 years old travel shorter distances to work but take longer to complete their journey (see Table 5). This fact could be related to the mode of transport choice, and the number of stops along their journey analysed in the following subchapters. It is worth noting that there is no

data over 75 years old for women in the Portuguese sample and the Greek dataset for both men and women above 65 years old. This reflection might be related to the fact that data was collected only through a web-page survey due to the COVID-19 pandemic restrictions and limitations, where physical contact was avoided, especially with older people.

The following tables present the average time and distance from the respondents' most frequent journey from the remaining 5 TInnGO hubs. As explained previously, the Baltic Hub collected data from Lithuania, Latvia, and Estonia, and the German Hub gathered data from Germany. In addition, only half of the Romanian, Scandinavian and UK samples have respondents from Alba Iulia MA, Malmo MA, and Birmingham MA. Thus, the expected results are different and less comparable with the 5 metropolitan datasets presented above, as longer distances are expected, as shown in Table 6 and an increase in the average time, as presented in Table 7.

Average distance (Km)	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
18-24 years	29	11	41	16	73	46	103	59	101	110
25-34 years	34	28	42	26	26	48	61	59	97	97
35-44 years	22	19	48	28	77	52	71	62	91	67
45-54 years	37	5	58	35	81	57	68	79	70	32
55-64 years	6	7	49	34	47	98	81	64	80	44
65-74 years	26	20	36	17	88	100	62	114	-	-
>75 years	7	3	22	18	-	-	73	97	-	-
Average	23	13	43	25	65	67	74	76	88	70

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 6 Average distance travelled in kilometres by age and gender per hub

Regarding distance travelled, in most samples, working-age men between 18 and 64 years old travel longer distances than women, as shown in Table 6. No clear trend was found above 65 years old, and no data was available in the UK sample for both genders above 65 years old and in the Baltic dataset above 75 years old. As mentioned previously, these age group gaps result from the type of surveys used - online questionnaires due to the pandemic restrictions, especially for vulnerable groups such as the elderly.

Regarding the average time in these datasets, it is not possible to find a common standard for these 5 hubs, but trends were observed in some age groups (see Table 7). In most hubs, working-age men between 18-24 and 35-65 years old take more time than women in their most frequent journey. The exception is specific age groups in the UK sample, where working-age women between 45-64 years old take more time than men. Moreover, in the Scandinavian

sample, men from all age groups take more time than women in the most frequent journey. There is no clear trend above 65 years old. As mentioned, no data was available in the UK sample for both genders above 65 years old and in the Baltic dataset above 75 years old.

Average time (MM)	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
18-24 years	51	23	32	24	60	34	53	24	56	56
25-34 years	31	32	34	32	30	35	31	33	52	47
35-44 years	22	23	37	27	46	40	40	34	45	34
45-54 years	32	24	39	34	45	36	30	32	48	55
55-64 years	28	27	40	39	35	54	44	31	28	42
65-74 years	18	28	32	20	64	50	22	60	-	25
>75 years	25	30	23	20	-	-	24	38	-	-
Average	30	27	34	28	47	42	35	36	46	43

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 7 Average time travelled in kilometres by age and gender per hub

From these 5 datasets, it is possible to conclude that working-age men travel longer distances and take more time than women in their most frequent journey.

4.2. Transport choice in the most frequent journey

This subchapter analyses information about the primary modes of transport used by the respondents in the most frequent journey pre-COVID-19, without restrictions or limitations associated with the pandemic using the full 10 hubs' datasets. It should be noted that in all surveys, the respondents could choose all the modes used in their most frequent trip. The exception was the Italian hub that due to a hub's design option, respondents could only choose the mode of transport used in the longer leg of their trip.

Regarding the transport mode used in the most frequent journeys by gender and age,

Table 8 presents the results from the 5 datasets focusing on metropolitan areas – Paris MA (France), Turin MA (Italy), Valencia MA (Spain), Thessaloniki MA (Greece) and Lisbon MA (Portugal). In these 5 samples, some common trends are observed: the car is the most popular transport choice regarding respondents' most frequent journeys in 3 samples (see Table 8). The exceptions are in the French and Spanish datasets, where public transport and walking, respectively, are the most popular ones.

Mode choice	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
Walk	31%	29%	19%	32%	32%	40%	24%	27%	19%	22%
Owned bicycle	5%	5%	5%	2%	2%	4%	9%	2%	1%	2%
Private car as a driver	23%	19%	61%	43%	40%	26%	49%	45%	45%	26%
Private car as a passenger	5%	7%	2%	2%	2%	7%	10%	14%	7%	10%
Public transport	36%	40%	13%	21%	24%	23%	8%	12%	28%	40%

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 8 Transport mode(s) used in the most frequent trip on a weekday by gender per hub

In the 5 samples, the difference between genders relies on being a car driver or passenger. Men use more private vehicles as drivers and women as passengers, with the biggest differences observed in Italian, Spanish and Portuguese hub samples. Another trend observed is that women use more public transport than men, except in the Spanish dataset. It is worth highlighting the low levels of use of public transport (PT) by men in the Greek and Italian samples and the high levels of car usage in the Italian and Greek datasets for both genders (see

Table 8). In the case of the French, Portuguese and Spanish hubs, people have reported higher levels of public transport use in their most regular trips.

As observed in Table 9, it is also possible to conclude that in the subsequent 5 datasets, the car is the primary mode of transport used by the respondents for a typical weekday (without COVID-19 restrictions and limitations), with higher percentages of men as drivers in all 5 hubs and women as passengers in 4 samples (except for the UK dataset).

Mode choice	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
Walk	18%	19%	23%	23%	28%	33%	24%	25%	31%	33%
Owned bicycle	6%	2%	18%	16%	10%	5%	15%	18%	8%	5%
Private car as a driver	53%	30%	32%	22%	37%	25%	35%	26%	31%	29%
Private car as a passenger	8%	21%	6%	11%	11%	17%	8%	6%	10%	15%
Public transport	15%	28%	21%	28%	14%	20%	18%	25%	20%	18%

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 9 Transport mode(s) used in the most frequent trip on a weekday by gender per hub

As observed in the previous datasets, women use more public transport than men in 4 datasets, except for the UK sample.

Regarding the use of the bicycle in the most frequent journey, the Greek sample also shows higher bike use levels than the other metropolitan areas (see Table 8), but still low compared with the Scandinavian and German results, presented in Table 9. In the German and Scandinavian samples, the use of the bicycle is close to the level of public transport and walking use. In the Scandinavian sample, the results are not surprising as Scandinavian cities, such as these, generally outperform other cities on most indicators regarding transport systems sustainability, such as the use of the soft modes (bicycle and walk) as usual modes of transport. In this context, the Portuguese dataset presents the lowest percentages of bike usage in the most frequent journey, which may be a consequence of problems in the infrastructure and accessibility for cycling, i.e., parking available, public bike systems.

It should be highlighted that the high levels of car usage and low PT use observed in the 10 TInnGO's samples can be related to low levels of transport offer, security and accessibility to stops or stations, especially in suburban areas forcing people to choose private vehicles. In the case of Valencia MA, these findings are aligned with the conclusions presented in the "Transport breakfast: Smart Mobility" conference organised by ITENE during the TInnGO project of people living in suburban areas.

4.3. Transport choice per trip purpose

This subchapter analyses the mode choice per trip purpose, without restrictions or limitations associated with the COVID-19 pandemic, using the full 10 hubs' datasets. It should be noted that in all surveys, the respondents could choose all the modes used per trip purpose.

4.3.1. PT per trip purpose

As mentioned earlier, in the most frequent journey, women use more PT than men, except in the Spanish sample, which presents no significant differences between genders (see Table 8). Regarding the use of PT per trip purpose and gender in the 5 samples focusing on the metropolitan areas - French, Italian, Greek and Spanish datasets, results can be observed in Table 10. In this context, PT is mainly used for commuting between home and work or university, followed by running an errand and visiting a close friend or relative. According to Table 10, the Italian hub (Turin MA) has the highest percentages of PT usage and the Greek hub (Thessaloniki MA) the lowest, in line with the low levels of satisfaction with the transport system (observed in the following chapters of this deliverable on PT satisfaction).

Mode choice	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	11%	11%	7%	8%	5%	4%	2%	2%	8%	11%
Visiting a shopping center	17%	16%	13%	13%	21%	17%	18%	15%	15%	17%
Running an errand	16%	15%	24%	23%	20%	16%	16%	20%	27%	22%
Going out for dinner	14%	13%	14%	12%	17%	18%	25%	17%	14%	12%
Visiting a close relative/friend	18%	20%	16%	20%	18%	19%	21%	22%	11%	14%
Job/university	24%	25%	26%	24%	19%	26%	18%	24%	25%	24%

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 10 Public transport per trip purpose and gender in percentage per hub

In the following 5 samples - Romanian, Scandinavian, Baltic, German, and UK, women also use more public transport than men, except in the UK sample, which presents no significant differences between genders (see Table 9). Regarding PT per trip purpose, according to Table 11, it is possible to conclude that public transport is mainly used to visit a close relative/friend, followed by going to work or university.

Mode choice	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	12%	17%	8%	8%	10%	10%	9%	9%	12%	14%
Visiting a shopping center	16%	16%	14%	16%	13%	16%	18%	18%	21%	21%
Running an errand	16%	23%	12%	13%	20%	21%	13%	16%	14%	13%
Going out for dinner	21%	8%	21%	17%	17%	15%	18%	15%	14%	17%
Visiting a close relative/friend	16%	17%	25%	21%	20%	19%	23%	26%	20%	16%
Job/university	19%	19%	20%	25%	20%	19%	19%	16%	19%	19%

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 11 Public transport per trip purpose and gender in percentage per hub

4.3.2. Private vehicles per trip purpose

The following table illustrates the percentage of people who use the car per trip purpose and gender in the samples focusing on the metropolitan areas - French, Italian, Greek and Spanish datasets. Regarding car per trip purpose, according to Table 12, the car is used primarily for visiting a close relative or friend, followed by visiting a shopping centre and going out for dinner, which may be evidence of good overall accessibility in terms of parking. In this context, it should be noted that the French hub (Paris MA) presents the lowest rate of private transport to work/university-related trips.

Mode choice	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	18%	18%	16%	17%	15%	16%	13%	14%	18%	18%
Visiting a shopping center	18%	16%	18%	18%	21%	20%	19%	20%	17%	18%
Running an errand	18%	18%	15%	14%	12%	13%	15%	15%	16%	16%
Going out for dinner	17%	17%	18%	17%	16%	17%	17%	18%	17%	18%
Visiting a close relative/friend	19%	19%	19%	21%	21%	21%	19%	18%	18%	18%
Job/university	10%	12%	14%	13%	15%	13%	17%	15%	14%	12%

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 12 Private vehicles per trip purpose and gender in percentage per hub

Table 13 shows the results from the remaining 5 datasets (the Romanian, Scandinavian, Baltic, German, and UK) regarding using private vehicles per trip purpose and gender. The most popular use of the car is to visit a close relative or friend, followed by shopping for groceries and visiting a shopping centre, which may be evidence of good overall accessibility in terms of parking.

Mode choice	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	18%	18%	18%	19%	16%	18%	18%	18%	18%	18%
Visiting a shopping center	17%	18%	18%	18%	18%	18%	17%	17%	17%	17%
Running an errand	17%	17%	18%	17%	17%	17%	18%	18%	15%	17%
Going out for dinner	13%	13%	12%	12%	14%	14%	15%	13%	17%	17%
Visiting a close relative/friend	18%	19%	20%	21%	19%	19%	19%	20%	18%	18%
Job/university	17%	15%	14%	13%	16%	14%	13%	14%	15%	13%

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 13 Private vehicles per trip purpose and gender in percentage per hub

4.3.3. Walking per trip purpose

The following table shows the French, Italian, Greek, Spanish and Portuguese samples regarding walking by gender in the most frequent journeys. In these samples, people walk mostly to shop for groceries and run errands. It should be noted that it includes walking to PT stops or stations and the car.

Mode choice	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	24%	24%	29%	27%	28%	26%	32%	31%	27%	27%
Visiting a shopping center	12%	10%	9%	9%	10%	11%	9%	5%	17%	15%
Running an errand	25%	25%	33%	32%	28%	26%	26%	29%	23%	26%
Going out for dinner	15%	13%	12%	13%	17%	16%	17%	12%	16%	15%
Visiting a close relative/friend	10%	11%	7%	5%	9%	10%	10%	12%	3%	5%
Job/university	14%	17%	10%	14%	8%	11%	6%	11%	14%	12%

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 14 Walking per trip purpose and gender in percentage per hub

Regarding walking by gender in the most frequent journeys in the Romanian, Scandinavian, Baltic, German, and UK samples, results are presented in Table 15. The same trend is observed in these samples, as people walk mostly to shop for groceries and run errands. Though respondents also walk to go out for dinner in the Baltic, German and Scandinavian datasets.

Mode choice	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	23%	28%	28%	31%	25%	22%	22%	24%	18%	21%
Visiting a shopping center	13%	11%	10%	9%	22%	19%	11%	11%	14%	14%
Running an errand	25%	26%	24%	28%	13%	17%	22%	23%	28%	29%
Going out for dinner	20%	16%	25%	19%	21%	24%	23%	22%	17%	15%
Visiting a close relative/friend	5%	6%	4%	4%	8%	4%	10%	8%	10%	10%
Job/university	14%	13%	9%	9%	11%	14%	12%	12%	13%	11%

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 15 Walking per trip purpose and gender in percentage per hub

4.3.4. Biking (owned and shared) per trip purpose

A trend is observed in all hubs, as bicycles (owned) are not yet prevalent as a transport mode, as respondents prefer to walk and use more traditional modes of transport such as cars and PT. This behaviour may also be a respondents' response to the lack of infrastructure and accessibility for cycling in the metropolitan areas and regions analysed.

Table 16 shows the French, Italian, Greek, Spanish and Portuguese results concerning the bike usage per trip purpose, in which the most popular use is for running errands. However,

respondents prefer biking to commute to work or university in the French sample, Paris MA, which can be related to improvements in the city’s infrastructure and accessibility for cycling, as “Paris leapt from 13th place in 2017 to 8th in 2019 on Wired’s list of the 20 most bike-friendly cities in the world¹”.

Mode choice	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	13%	14%	14%	9%	10%	10%	6%	33%	20%	20%
Visiting a shopping center	15%	13%	12%	15%	7%	16%	6%	8%	20%	10%
Running an errand	18%	13%	36%	35%	37%	24%	35%	25%	20%	30%
Going out for dinner	11%	10%	11%	11%	0%	8%	12%	8%	5%	10%
Visiting a close relative/friend	13%	22%	12%	9%	23%	14%	12%	17%	15%	15%
Job/university	30%	28%	15%	21%	23%	28%	29%	9%	20%	15%

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 16 Biking (owned) per trip purpose and gender in percentage per hub

In Table 17, Romanian, Scandinavian, Baltic, German, and UK samples’ results are presented regarding biking per trip purpose and gender in the respondents’ most frequent journeys. As expected, the highest levels of cycling as a mode of transport are seen in Scandinavian and German samples, mainly for running errands. In this context, it should be highlighted that in the German and Scandinavian samples, the bicycle starts to be a prevalent option for running errands, shopping for groceries, and activities related to work/study. Similar behaviours were observed in the previous results regarding the mode choice in the respondents’ most frequent journey, as shown in Table 9. However, women are more likely to cycle than men in the German dataset, while the Scandinavian sample showed the opposite.

¹ <https://www.wired.com/story/most-bike-friendly-cities-2019-copenhagenize-design-index/>

Mode choice	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	22%	22%	19%	22%	15%	17%	20%	19%	15%	7%
Visiting a shopping center	11%	3%	13%	11%	10%	10%	10%	12%	9%	12%
Running an errand	27%	38%	27%	26%	24%	22%	24%	25%	32%	32%
Going out for dinner	8%	2%	17%	16%	17%	15%	13%	11%	7%	10%
Visiting a close relative/friend	11%	15%	7%	5%	11%	14%	13%	12%	14%	15%
Job/university	21%	20%	17%	20%	23%	22%	20%	21%	23%	24%

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 17 Biking (owned) per trip purpose and gender in percentage per hub

In the 10 samples analysed, the use of shared bike systems is not yet widespread. In these datasets, there are no clear trends regarding gender. For instance, according to the Municipal Mobility and Parking Operator (EMEL) of Lisbon, in recent months (second semester of 2020), approximately 65% of men have used their shared bikes' system – GIRA, even though in the Lisbon MA sample analysed, women use more bicycles than men (see Table 8).

4.3.5. Shared modes (car, scooter, and electric scooter) per trip purpose

Shared modes (car, scooter, and electric scooter) are not widespread among the 10 hubs' samples. However, a trend is observed in these circumstances as shared modes are mostly used for going out for dinner (see Table 18 and Table 19). It should be noted that the French (Paris MA), the Italian (Turin MA), the Portuguese (Lisbon MA) and the UK hubs' samples present the highest levels of shared modes usage. Low use levels could be related to inadequate shared systems offered in the metropolitan areas, and regions/countries analysed.

Mode choice	FR		IT		ES		GR		PT	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	16%	13%	12%	14%	6%	5%	0%	6%	16%	19%
Visiting a shopping center	18%	14%	14%	14%	19%	5%	0%	12%	24%	19%
Running an errand	13%	19%	18%	20%	19%	11%	25%	6%	19%	18%
Going out for dinner	17%	14%	27%	17%	25%	32%	25%	29%	22%	19%
Visiting a close relative/friend	19%	22%	8%	17%	19%	26%	25%	29%	10%	13%
Job/university	17%	18%	21%	18%	12%	21%	25%	18%	9%	12%

Note: M – men, W – women, FR – French, IT – Italian, ES – Spanish, GR – Greek, PT – Portuguese

Table 18 Shared modes per trip purpose and gender in percentage per hub

Mode choice	RO		Scandinavian		Baltic		DE		UK	
	M	W	M	W	M	W	M	W	M	W
Shopping for groceries	14%	17%	17%	17%	15%	15%	21%	17%	20%	17%
Visiting a shopping center	14%	20%	28%	33%	12%	12%	5%	8%	16%	19%
Running an errand	14%	17%	11%	33%	20%	16%	16%	8%	13%	12%
Going out for dinner	29%	23%	11%	0%	17%	21%	16%	21%	21%	29%
Visiting a close relative/friend	14%	3%	16%	0%	14%	19%	32%	25%	17%	15%
Job/university	15%	20%	17%	17%	22%	17%	10%	21%	13%	8%

Note: M – men, W – women, DE – German, RO – Romania, UK – United Kingdom

Table 19 Shared modes per trip purpose and gender in percentage per hub

4.4. Multi-stop trips per trip purpose

In this subchapter, the aim was to understand, for example, how gender and culture influence travellers' mobility behaviours and decisions regarding multi-stop trips. In most datasets analysed, the number of stops along the main journey is higher for women (see Table 20), except in the UK sample. Other trends can also be observed in most samples: women say they stop more for shopping and escort dependents, while men stop more for work-related reasons and leisure.

Hubs	Multi-stops		Reasons for stop									
	W	M	Shopping		Leisure		Work/Study		Health		Dependents	
			W	M	W	M	W	M	W	M	W	M
French	15%	11%	36%	37%	11%	13%	17%	16%	18%	26%	17%	8%
Italian	12%	8%	42%	32%	18%	25%	16%	18%	13%	9%	16%	11%
Spanish	12%	10%	37%	21%	31%	43%	17%	27%	7%	7%	7%	7%
Greek	5%	3%	37%	20%	17%	24%	23%	20%	13%	16%	10%	20%
Portuguese	9%	7%	30%	31%	24%	24%	28%	31%	11%	7%	7%	7%
Romanian	17%	11%	19%	11%	7%	4%	6%	10%	5%	3%	1%	0%
Scandinavian	11%	10%	12%	11%	4%	5%	11%	13%	2%	3%	3%	2%
Baltic	17%	14%	22%	19%	17%	18%	29%	35%	9%	7%	4%	2%
German	11%	8%	12%	9%	9%	11%	8%	9%	7%	3%	4%	1%
UK	7%	17%	11%	19%	10%	17%	7%	20%	2%	2%	1%	2%

Note: W – Women, M - Men

Table 20 Multi-stop trips per trip purpose by gender per hub

4.5. Travelling with dependents and transport choice

In the datasets analysed, the gap is decreasing in terms of travellers' behaviour when escorting dependents (see Table 21) except for the Greek and French samples, which present the biggest differences between genders, with women travelling more with dependents than men. Regarding the choice of mode of transport for people who travel with the dependents, it was possible to see that both genders choose private vehicles. The exceptions are in the Spanish data, where women prefer walking to using the car, the Romanian sample where men prefer to walk, and the UK dataset where both genders prefer to walk to escort dependents. Biking and PT are less preferred modes when travelling with dependents, which may be evidence of low accessibility to public transport for the vulnerable population (disabled, elderly or children).

Hubs	Travel with dependents		Modes used							
	W	M	PT		Private car		Walking		Cycling	
			W	M	W	M	W	M	W	M
French	10%	6%	18%	24%	34%	27%	32%	33%	16%	16%
Italian	6%	9%	0%	22%	71%	63%	17%	12%	13%	2%
Spanish	5%	2%	4%	10%	31%	40%	65%	40%	0%	10%
Greek	11%	6%	0%	7%	65%	53%	30%	53%	17%	5%
Portuguese	6%	7%	21%	15%	52%	69%	21%	12%	7%	4%
Romanian	5%	6%	5%	8%	50%	25%	41%	58%	5%	8%
Scandinavian	5%	4%	15%	13%	41%	41%	27%	22%	17%	25%
Baltic	15%	16%	18%	12%	35%	36%	35%	36%	12%	20%
German	8%	7%	13%	18%	21%	29%	34%	27%	32%	27%
UK	10%	14%	13%	8%	38%	32%	41%	48%	7%	13%

Note: W – Women, M - Men

Table 21 Travelling with dependents vs transport choice in the most frequent trip by gender per hub

5. Assessing harassment experiences as travellers

Transport security is a critical factor in the choice of transport mode, especially for most vulnerable user groups, including women and elderly people. Reports of incidents are generally related to the use of public transport. For example, women feel that trains and rail stations are vulnerable spaces. On one side, when crowded, harassment could occur; on the other side, when empty, there is no one available to intervene and help in case of emergency. Unfortunately, most incidents are not reported to the authorities. Therefore, it is important to understand the reasons for the lack of trust in security authorities. Respondents to this study were asked to indicate whether they reported their incident and, if not, why. Contrary to what might be expected, the reported incidents do not skew towards any gender category due to the general characterisation of harassment as theft, sexual and verbal harassment.

It should be highlighted that the areas where the harassment is concentrated indicate potential urban spaces to introduce interventions to increase public transport security.

5.1 Harassment incidents in 6 MA

In this chapter, the results presented are from Paris MA (279 answers), Turin MA (420 answers), Thessaloniki MA (231 answers), Valencia MA (442 answers), Lisbon (373) and Malmo MA (210 answers) datasets. Aspects related to respondents' mobility behaviour, perception of security aspects and means to improve it were asked. Negative experiences (harassment incidents) were stated in one of the following ways: indication of the location where the harassment occurred on the map or indication of the street or place name.

5.1.1 Incidents and reporting per MA

In total, 1955 replies were collected, and 372 respondents stated they had a harassment experience as travellers. A pattern appears across all the metropolitan areas analysed. In this sample, the percentage of harassment incidents ranged from 6 (Valencia) to 39% (Malmo). However, a relatively low percentage of travellers has reported the incident, from 17% (Malmo) to 35% (Paris). Figure 14 presents the number of replies obtained in each city and the number of harassment incidents.

Metropolitan areas	Lisbon	Malmö	Paris	Turin	Thessaloniki	Valencia
Sample size	373	210	279	420	231	442
Harassment incidents (No.)	96	81	34	62	73	26
Harassment incidents (%)	26%	39%	12%	15%	32%	6%
Reported (No.)	19	14	12	12	16	5
Reported (%)	20%	17%	35%	19%	22%	19%
Reason for not reporting						
Afraid	3	4	2	4	4	4
Not aware of the process	2	5	3	3	2	1
No time to waste	4	2	4	2	3	2
Not a big deal	1	3	1	3	1	3
No trust in the police	5	1	2	1	3	3
Not my responsibility	6	6	5	5	5	5

Figure 14 Harassment incidents in six European metropolitan areas and reasons for not reporting by popularity (1 - most voted)

Furthermore, it is also presented in Figure 14 reasons why passengers did not report the incident to the Authorities ranked by popularity - being one the most voted reasons and travellers could choose one or more motives. On the one hand, Malmö and Turin's respondents seem not to trust the police. In contrast, in Lisbon, the reasons behind underreporting are not connected with a lack of trust in the police. Furthermore, Lisbon, Paris, and Thessaloniki's travellers do not describe the harassment experienced as a big deal. Moreover, it should be highlighted that, in Malmö, Turin and Valencia, the respondents with a harassment experience stated that they received below the average income. While in Lisbon and Thessaloniki, most of the affected ones belong to the "average" monthly income category. Nevertheless, there is a lack of information regarding the harassment reporting process (procedure and time spent) in all metropolitan areas. This situation may impede the improvements of security aspects and the monitoring of the incident frequency in the cities analysed.

Regarding the sample, a description per city follows:

- Paris Metropolitan Area: The reports are distributed between the men (47%) and women (53%), with a higher number of reports from young women. Most incidents occurred while walking on the street and using public transport, such as metro and rail stations. Only 35% of people have said to have reported the incidents to authorities. According to the table below, people choose not to report a situation of harassment, in general, because they do not trust that the authorities will give the necessary attention to the problem or ignore the importance of the incident. This information aligns with

previous evidence Malandrino and Berman (2020). They conducted several focus groups, and 14 participants stated that many users do not report the incidents because of their lack of trust in the justice system, believing that it would not result in anything and that the administrative procedures were considered too complicated. Consequently, it has been agreed to instruct public transport employees to assist victims in reporting incidents to act against this lack of confidence. In this dataset, it was not possible to get the GPS coordinates from the people that were harassed, only if was inside PT vehicles and stations, on the street or in a parking lot.



Figure 15 Incidents of harassment in the Paris Metropolitan Area

- Thessaloniki Metropolitan Area: The respondents from this city were the ones to report a higher number of incidents, with a similar distribution between gender (48% of men and 52% of women) and across age groups. Regarding the approximate location of each harassment, most of the reports occurred in the centre of the city, near bus/train stations, with a maximum of 27 occurrences in the same 1 km radius. The distribution between men and women does not follow any geographical pattern as both are concentrated in the city centre.

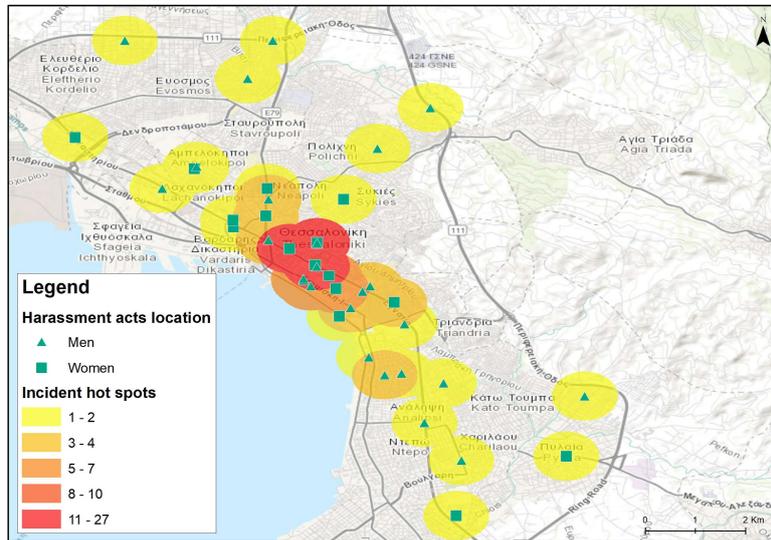


Figure 16 Incidents of harassment in the Thessaloniki Metropolitan Area

- Valencia Metropolitan Area: In Valencia metropolitan area, incidents were primarily reported by women (77%), people between 18 and 54 years of age (92%), and people with an average income below the average of the country (46%). It is also worth noting that 22% of people that have reported an incident have some disability. Incidents are predominantly located in the centre of Valencia. The maximum number of incidents is 4, located near Nord Adif station. Incidents reported by women are located in the centre of the city, near public transport waiting areas, while incidents reported by men do not show a clear pattern.

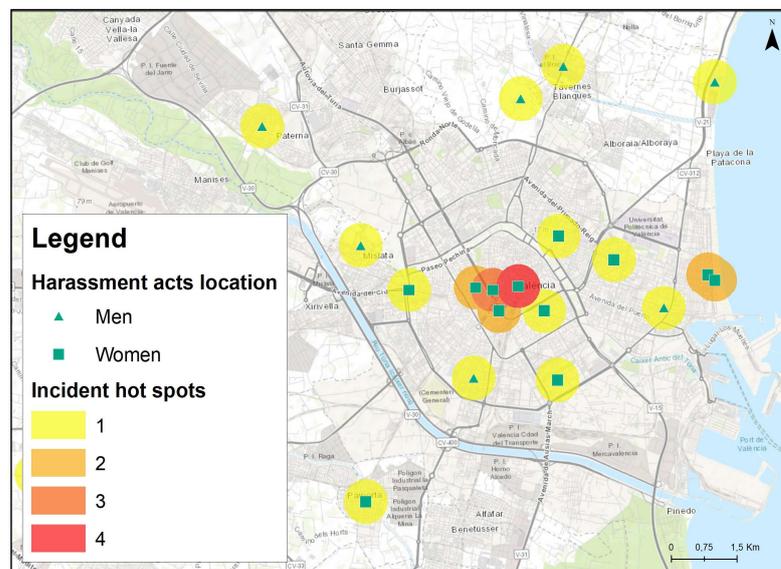


Figure 17 Incidents of harassment in the Valencia Metropolitan Area

- Turin Metropolitan Area: Similar to the data collected in Valencia, most cases of harassment were reported by women (72%) and primarily by people in the 25-34 age group (51%). The maximum number of incidents is 5 in a radius of 1 km, located in Castello square next to the public transport stations located here. Only 19% of the people complained to the authorities. The two leading causes for people not filing a complaint are the lack of trust in the authorities to pursue the case and the unwillingness to waste any more time on the situation.

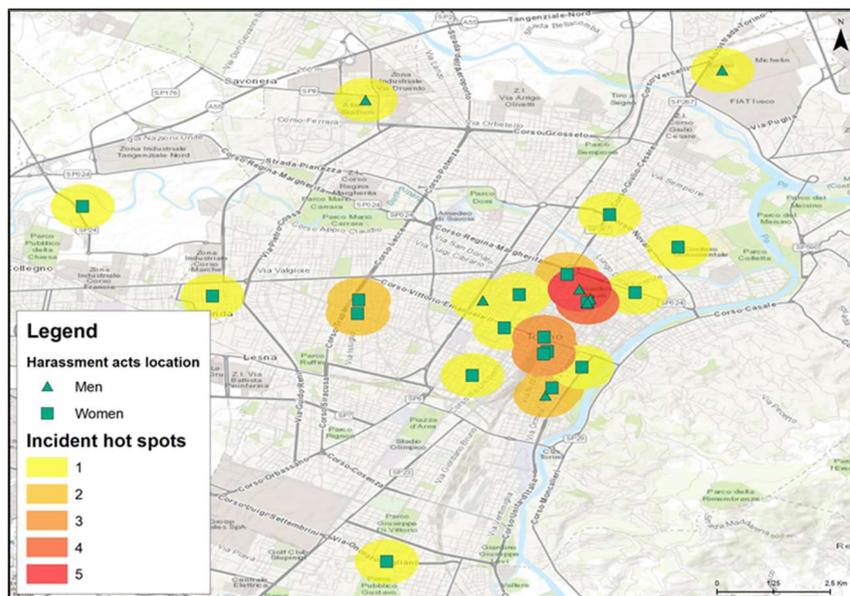


Figure 18 Incidents of harassment in the Turin Metropolitan Area

- Lisbon Metropolitan Area: The respondents from the Lisbon metropolitan area were the ones who reported the most incidents of harassment, with a similar distribution between gender (52% of women and 46% of men). Incidents are primarily in the Arroios parish, where 23 incidents were reported. The leading cause for people not filing a complaint is that they do not think it was a big deal and do not know how to proceed. 45% of those affected belong to the "below average" monthly income category. Figure 1 illustrates an example of the geographical analysis. It presents the results obtained for the Lisbon metropolitan area.

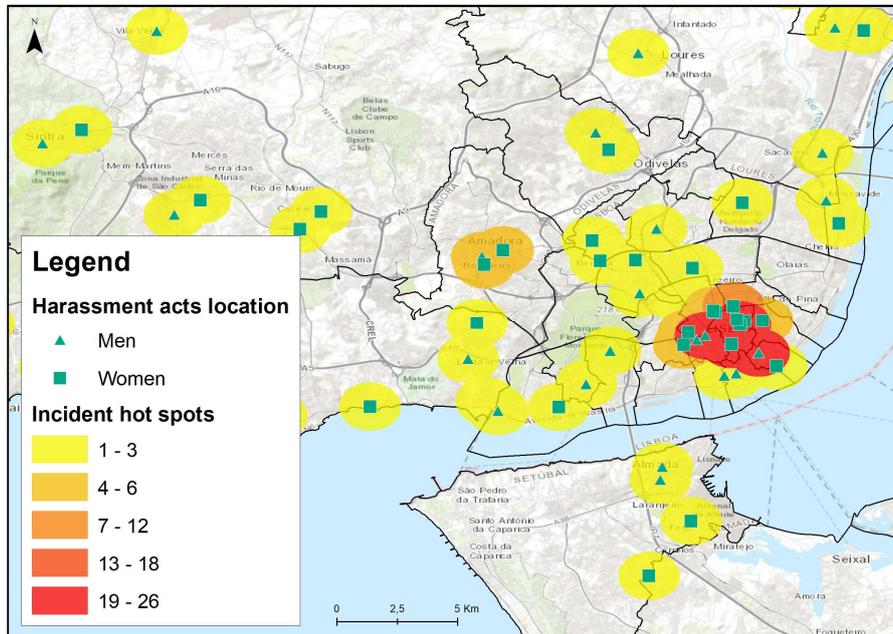


Figure 19 Incidents of harassment in the Lisbon Metropolitan Area

- Malmö Metropolitan Area: 81 incidents were reported in the Malmö metropolitan area, with a similar distribution between gender (49% of women and 51% of men). 46% of those affected belong to the "below average" monthly income category. The maximum number of incidents is 15 in a radius of 5 km. The leading cause for people not filing a complaint is the lack of trust in the authorities to pursue the case and the unwillingness to waste any more time on the situation.

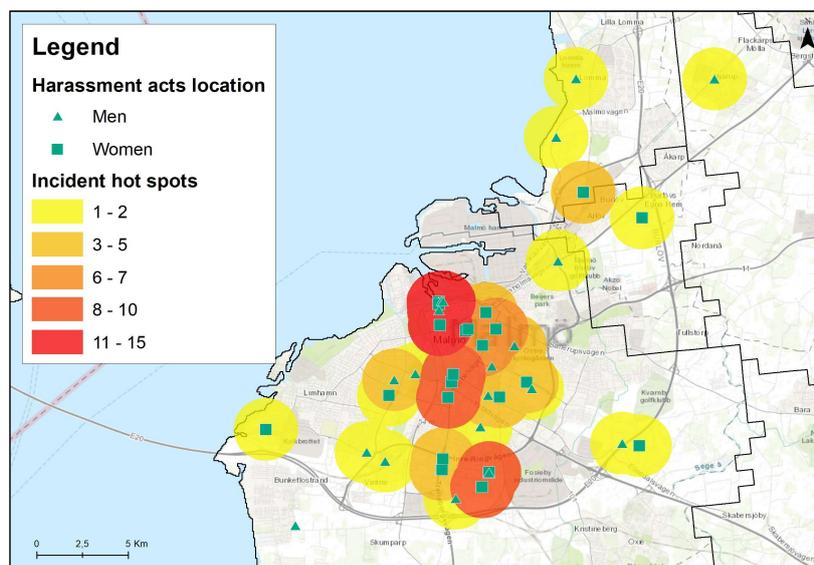


Figure 20 Incidents of harassment in the Malmö Metropolitan Area

5.1.2 Security perceptions per MA

Statistical analysis demonstrated differences in the perception of security attributes among people who reported harassment experiences and those who did not. Figure 21 demonstrates these differences ("+"), and it is observed that people with previous harassment experiences feel less secure at stations than other passengers in all metropolitan areas. While gender was not proved to affect passengers' perceptions, women of older ages rated lower in many security aspects when compared to younger women. This situation was observed in three metropolitan areas, namely Turin, Paris, and Lisbon, indicating that age can play a role in the perception of security.

Metropolitan areas	Paris	Turin	Valencia	Thessaloniki	Lisbon	Malmo
Less satisfied with the number of security staff visible	+	+		+		
Less satisfied with crowding levels in vehicles or waiting areas	+	+		+		
Less satisfied with security cameras in waiting areas	+				+	
Feel less secure at stations	+	+	+	+	+	+
Feel less secure inside vehicles	+	+		+		
Overall, less satisfied with the security aspects		+	+	+	+	

Figure 21 Differences in security aspects with and without harassment experiences

5.2 Other hubs results

The results from the other hubs were analysed separately, mainly due to time-frame constraints and the range of the dataset per hub. On the one hand, data from the UK and Romania arrived late and in batches due to administrative issues aggravated by the pandemic. On the other hand, the spatial data range available in the German and Baltic samples did not focus on one specific metropolitan area.

5.2.1 Baltic Hub (Lithuania, Latvia, and Estonia)

In this case, 91 respondents (21%) of the Baltic sample (440 respondents) reported having experienced threats of harassment or violence while travelling, 53.66% of women and 46.34% of men, in line with previous results. The age group with more harassment experiences is between 25 and 34, with 31.71% of the incidents informed in the survey. Figure 22 shows the approximate location of the incidents in the three Baltic States. Most incidents occurred in

Vilnius with 27 occurrences, followed by Kauno with 16 and Riga with 9. The distribution between men and women does not follow any geographical pattern. It is important to highlight that 41% of people harassed belong to the “above average” monthly income category of the countries.

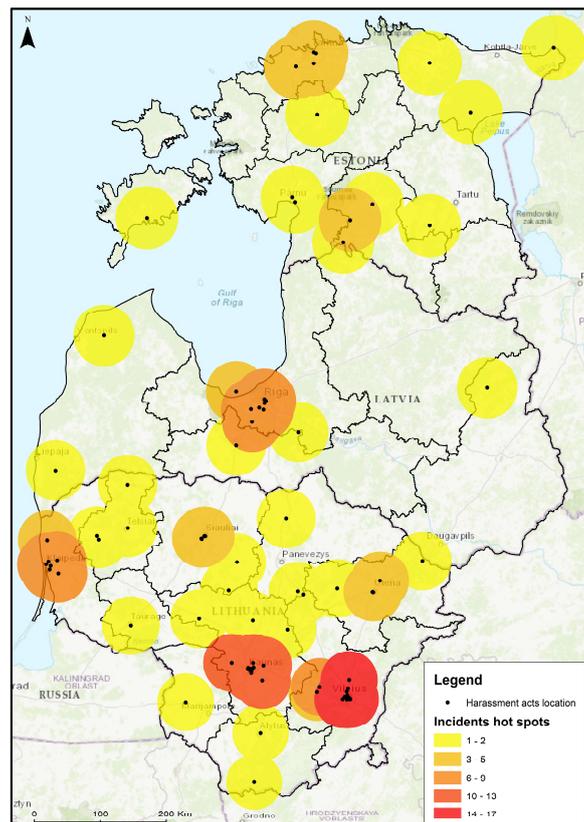


Figure 22 Location of harassment incidents in the Baltic countries

62% of people have reported the incidents to authorities, and Figure 23 presents the location of the incidents in the Baltic countries.

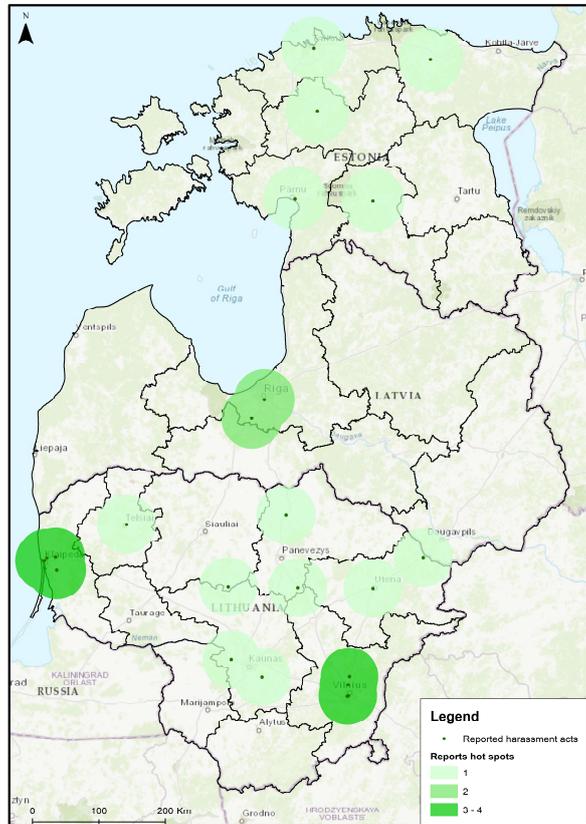


Figure 23 Location of reported incidents of harassment in the Baltic countries

According to Table 22, the most popular reasons passengers did not report the incident to the Authorities were because they were afraid, did not know how to proceed or thought the police was not taking it seriously. These last respondents felt that the authorities would not give the necessary attention to the problem or ignore the importance of the incident. It should be noted that travellers could choose more than one reason for not reporting.

Reason for not reporting a harassment incident	Ranking (most popular – 1)
Afraid	1
Didn't know how to proceed	2
Didn't want to waste time	3
Didn't think it was a big deal	4
Didn't think the police was taking it seriously	2
Didn't think that the responsibility of reporting is yours	4

Table 22 Reasons stated for not reporting an incident to authorities in the Baltic countries by popularity

5.2.2 German Hub

For the German case, 52 of 414 respondents, 13% of the total sample, had experienced sexual harassment, verbal threats, or violence while travelling. Similar to the data collected in the Baltic Hub, incidents of harassment were mainly experienced by women (55.77%), followed by men (44.23%). The age group with the higher number of harassment incidents is people between 25 and 34 years old (30.19% of people that have been harassed). Overall, incidents were experienced by people belonging to Germany's "average" monthly income category. It is also worth noting that 30.56% of people that were harassed have some disability. Figure 24 shows the approximate location of each harassment event in the country. Most of the reports occurred in West Rhine-Westphalia, followed by Western Thuringia, South Bavaria and Berlin with 14 occurrences.

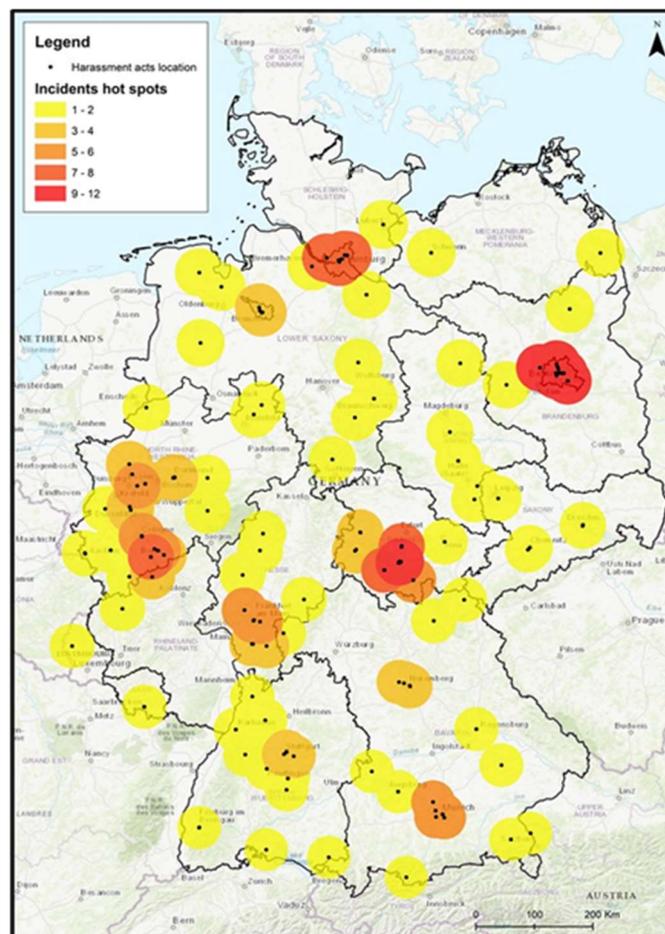


Figure 24 Location of harassment incidents in Germany

69% of people have said to have reported these incidents to authorities, and Figure 25 shows the approximate location of the reported incidents to the authorities.

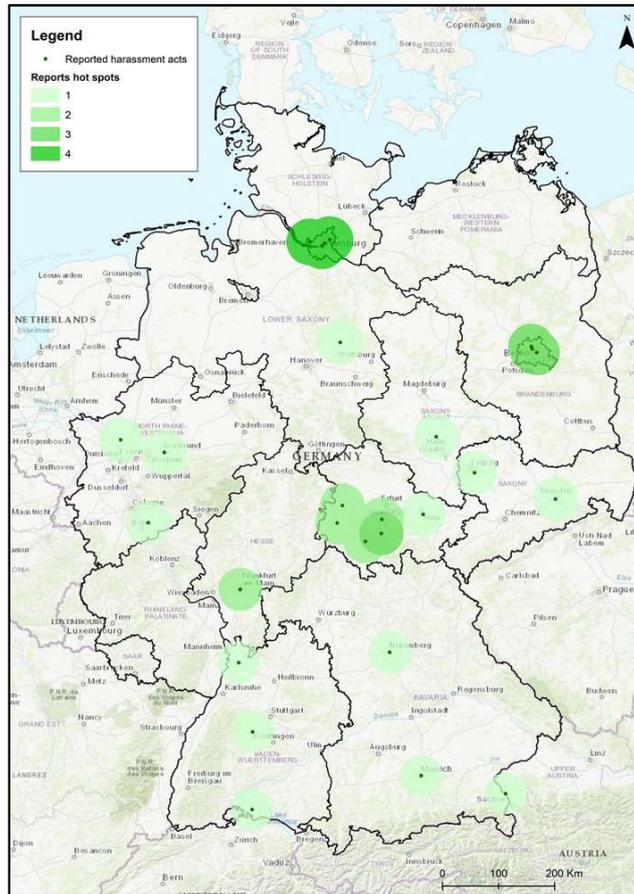


Figure 25 Location of reported incidents of harassment in Germany

As described in Table 23, the reasons for not doing so are because they expressed feeling afraid; also, they believe that it is not a big deal, and they believe that the responsibility of reporting is not theirs. It should be noted that travellers could choose more than one reason for not reporting.

Reason for not reporting a harassment incident	Ranking (most popular – 1)
Afraid	1
Didn't know how to proceed	4
Didn't want to waste time	3
Didn't think it was a big deal	2
Didn't think the police was taking it seriously	3
Didn't think that the responsibility of reporting is yours	2

Table 23 Reasons stated for not reporting an incident to authorities in Germany by popularity

5.2.3 Romanian Hub

For this case, only 8% of the sample size (527 respondents) reported having experienced sexual harassment, verbal threats or violence while travelling, a rather low percentage compared with the other hubs' samples. Moreover, being aware of these travellers' low satisfaction levels regarding PT security aspects (analysed in Chapter 6 - PT infrastructure and services satisfaction from a gender perspective), this percentage is surprising. It should be noted that during the survey dissemination in Romania, the hub had informed difficulties from the respondents in using Google Maps to add the coordinates of the harassment incidents in the survey; thus, the low level observed could be related to it. Additionally, it was pointed out that due to cultural reasons, people in Romania are not used to complaining, which could also be related to this low percentage of informed incidents.

Of the respondents that experienced harassment incidents, 52.50% were women, and 47.50% were men. The age group with the higher number of harassment experiences is between 18 and 24 years old (32.50% of people that reported incidents), followed by people between 25 to 34 years old (27.50% of people that expressed harassment incidents). It is important to highlight that 34% of people affected belong to Romania's "above average" monthly income category. Figure 26 shows the approximate location of each harassment incident. Incidents are located in different country regions; the maximum number of incidents is 17.

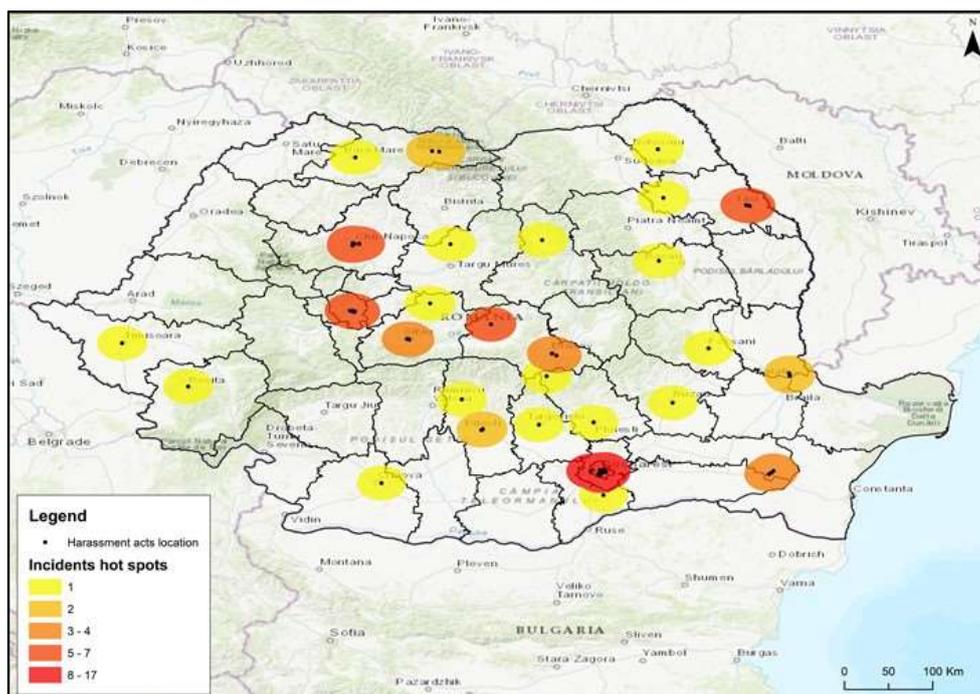


Figure 26 Location of harassment incidents in Romania

69% of people have said to have reported the incidents to Authorities. According to Table 24, people chose not to report to the authorities or transport operators due to the unwillingness to waste any more time on the situation, and they were afraid. Furthermore, victims did not know how to proceed, and they did not think the police would take the incident seriously. It should be noted that travellers could choose more than one reason for not reporting.

Reason for not reporting a harassment incident	Ranking (most popular – 1)
Afraid	2
Didn't know how to proceed	4
Didn't want to waste time	1
Didn't think it was a big deal	3
Didn't think the police was taking it seriously	3
Didn't think that the responsibility of reporting is yours	5

Table 24 Reasons stated for not reporting an incident to authorities in Romania by popularity

5.2.4 United Kingdom Hub

16% of 579 respondents reported having experienced sexual harassment, verbal threats, or violence while travelling in the UK sample. Since this dataset was unbalanced in terms of gender, it is not representative of the population, as men represented 65.44% and women only 34.26%, also harassment incidents were unbalanced, with 31% of women and 69% of men stating that they had been harassed as travellers. The age group with the higher number of harassment experiences is between 25 and 34 years old (31.31% of people that had been harassed), followed by people between 18 to 24 years old with 30.30%. It is important to highlight the differences in the reported incidents by the income level, with 39% of people affected belonging to the UK's "above average" monthly income category. Figure 50 shows the approximate location of each harassment incident. Incidents are primarily located in Birmingham; the maximum number of incidents is 71.

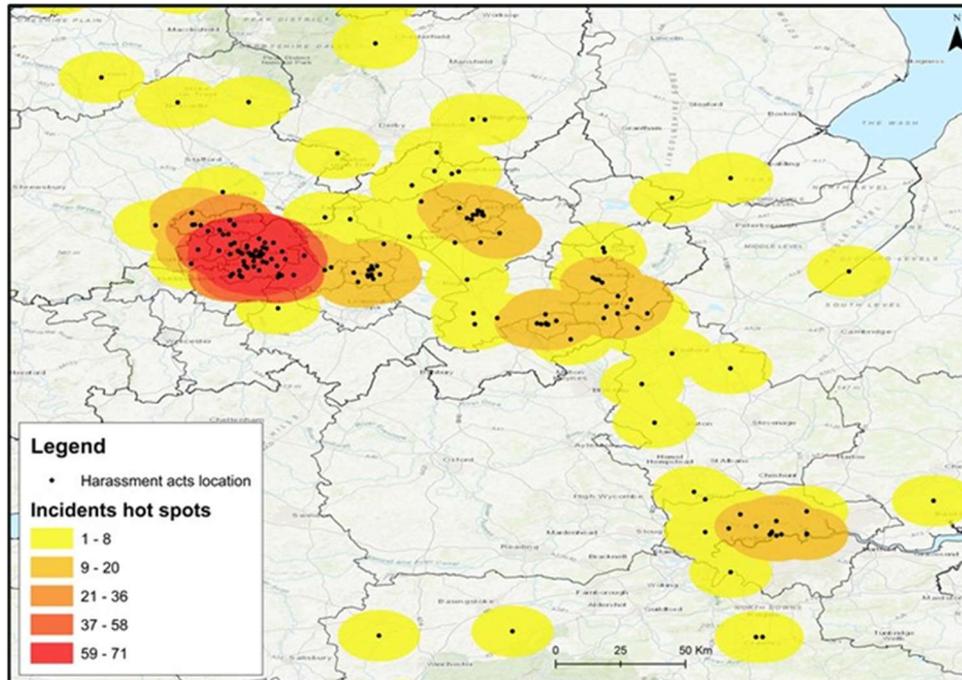


Figure 27 Location of harassment incidents in the United Kingdom

69% of people have said to have reported the incidents to authorities, and according to Table 25, people choose not to report a situation of harassment because they expressed the unwillingness to waste any more time on the situation and because they ignore the importance of the incident and also because they expressed feeling afraid

Reason for not reporting a harassment incident	Ranking (most popular – 1)
Afraid	3
Didn't know how to proceed	5
Didn't want to waste time	1
Didn't think it was a big deal	2
Didn't think the police was taking it seriously	4
Didn't think that the responsibility of reporting is yours	6

Table 25 Reasons stated for not reporting an incident to authorities in the UK by popularity

6. PT infrastructure and services satisfaction from a gender perspective

The satisfaction with PT varies across the 10 datasets analysed, and the greatest differences between genders are safety and security. It should be highlighted that in all hub samples, women always show lower levels of satisfaction when compared to men, except for the German dataset.

The survey used a Likert scale (1-completely disagree to 5-completely agree) to score the satisfaction with this mode of transport (Public Transport or Private vehicles) in different aspects. Analysing all the PT indicators - service, safety, security and infrastructure, the Baltic and the French hub samples have the highest satisfaction levels. In the Baltic dataset, women scored 3.67 and men 3.44, while in the French sample, women scored 3.13 and men 3.5. In the Romanian hub, women scored 3.43 and men 3.50, while in the UK sample, women scored 3.48 and men 3.15. On the opposite side, Thessaloniki presents the lowest rates regarding PT satisfaction (women 1.86 and men 2.25), in line with the respondents' transport mode's choice analysed in Table 8 Transport mode(s) used in the most frequent trip on a weekday by gender per hub. In the middle are the respondents from the Spanish hub rated the PT system with an average of 3.26 (women 3.19 and men 3.32), followed by the German Hub with an average of 3.23 (women 3.13 and men 3.33) and the Portuguese hub with an average of 3.09 (women 3.09 and men 3.09).

6.1. PT Service indicators per hub

The following table presents the aspects related to the use of PT service indicators where significant differences were found between the mean values for men and women. The values inside represent the differences between the means where positive values indicate that women have lower levels of satisfaction, and when negative, men have lower levels of satisfaction. These factors influence the two groups differently, as observed in Table 26.

The Greek and Scandinavian samples show no differences in terms of gender. The French and the Romanian samples show differences between the two genders in more factors. However, while in the French dataset, women are less satisfied than men in the overall PT service indicators, men are less satisfied than women in the Romanian dataset. In this context, in the UK hub sample, the men are less satisfied with PT services regarding users' needs, price, and real-time information (see Table 26).

PT – Service indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Users' needs are satisfied	0.253	-0.31							-0.624	-0.536
Price	0.531								-0.624	-0.348
Connectivity with other modes	0.377								-0.553	
Level of information available	0.295					0.419			-0.553	
Reliance on real-time information			0.302		-0.449		0.088		-0.520	-0.400

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 26 Mean difference in levels of satisfaction between men and women related to PT service indicators per hub

In Germany, the available information level is a key aspect for women, while in the Spanish and Portuguese samples, real-time information is critical for women. In the Baltic states, Romania and the UK samples, the men are less satisfied with real-time information provided by PT operators.

6.2. PT Safety indicators per hub

As shown in Table 27, regarding all PT safety indicators, the level of satisfaction is lower among women than men in the Greek and French hub samples, while in the Romanian hub sample, men are less satisfied with all. In the Spanish sample, women are less satisfied with PT safety aspects while waiting in stops/stations and on-board. For the men in the Baltic hub sample, safety while waiting for public transport is a key aspect. No significant differences were found between the two genders in the Italian, Portuguese, Scandinavian and UK datasets.

In the Spanish, Greek and French samples, safety while waiting for public transport and on-board are key aspects for women that, if improved, could increase women's satisfaction levels regarding PT safety. In the German, French and Greek datasets, parking spaces surrounding stations/bus stops are key characteristics for women.

PT – Safety indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Safety while waiting for vehicles	0.382		0.403	0.626	-0.329				-0.590	
Safety onboard of vehicles	0.46		0.275	0.487					-0.475	
Improvements made by operators in reaction to safety incidents	0.453			0.371			0.13		-0.475	-0.421
Speed of authorities while dealing with incidents in waiting areas	0.313			0.483				-0.429	-0.320	
Speed of authorities while dealing with incidents inside vehicles	0.414			0.724					-0.320	
Willingness of drivers to deal with incidents	0.473			0.470					-0.467	
Safety in parks surrounding stations/ bus stops areas	0.454			0.958		0.725			-0.467	
Overall satisfaction with safety in public transport	0.421				-0.317	0.303			-0.672	

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 27 Mean difference in levels of satisfaction between men and women related to PT safety indicators per hub

6.3. PT Security indicators per hub

Women are less satisfied with almost all PT security aspects in the French sample. In contrast, men are the ones less satisfied in the Romanian sample. When analyzing the passenger experience in PT's waiting areas and onboard, the Greek dataset shows significant differences between genders, as observed in Table 28. In this case, the respondents of the Greek hub have expressed the lowest values of satisfaction. To improve the service, the respondents indicated that increasing the number of security cameras and making staff more visible to passengers could be potential measures to enhance the improvement of security perception for women. In the German hub sample, women are less satisfied with overall security in public transport, namely with security inside vehicles, visual crowding onboard and in waiting areas, and the

feeling of crowding also onboard and in waiting areas. No significant differences were found between the two genders in the Italian, Baltic, Portuguese, Scandinavian and UK datasets.

PT – Security indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Number of security staff visible in waiting areas	0.35		0.291	0.501					-0.225	
Crowding levels in vehicles and waiting areas	0.36					0.358			-0.288	
Safety I feel safe with the level of crowding in public transport vehicles or waiting areas	0.465		0.335			0.434			-0.410	
Number of security cameras in waiting areas	0.292			0.683					-0.430	
Number of security cameras inside vehicles	0.374								-0.530	
Security in waiting areas	0.551			0.636		0.586	0.064	0.427	-0.337	
Security inside vehicles	0.507			0.856		0.564	0.034		-0.341	-0.322
Overall satisfaction with security in public transport	0.367		0.246	0.375		0.480			-0.341	-0.347

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 28 Mean difference in levels of satisfaction between men and women related to PT security indicators per hub

In half of the hubs, enhancements in the security in PT waiting areas and onboard could potential improve women’s perception and overall satisfaction with security in PT.

6.4. PT Infrastructure indicators per hub

Women in the French and the UK hub samples are less satisfied with most PT infrastructure indicators. On the contrary, in the Romanian hub sample, the men are less satisfied with almost all PT infrastructure aspects. For the Greek sample, the most relevant aspects for women are the location and conditions in waiting areas or stops.

In the German hub sample, differences between genders were found regarding the respect for dedicated spaces for wheelchairs and baby trolleys, critical for people with disabilities and

travelling with dependents. For women in the German sample, these are key aspects that could increase women’s satisfaction with PT infrastructure if improved. No significant differences were found between the two genders concerning infrastructure indicators in the Italian, Spanish, Baltic, Portuguese, and Scandinavian datasets, as shown in Table 29.

PT – Infrastructure indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Number of panic buttons in waiting areas	0.362								-0.371	0.362
Existing lighting in waiting and surrounding areas				0.574		0.347			-0.443	
Passenger's respect for dedicated space baby trolleys	0.383					0.521			-0.276	0.383
Passenger's respect for dedicated space for wheelchairs/trolleys	0.379					0.442				0.379
Shelter provided in waiting areas	0.362			0.633					-0.528	0.362
Location of PT stops	0.445			0.713					-0.561	0.445
Connection between different modes of transport	0.271								-0.335	0.271
Level of comfort travelling with dependents (availability of seats, priority seats,...)	0.346									0.346
Level of information available about the conditions of accessibility along the route and at destination	0.407								-0.328	0.407
Accessibility for people with disabilities (space inside vehicles, priority seats, existing lifts, and escalators, etc.)	0.449								-0.371	0.449

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 29 Mean difference in levels of satisfaction between men and women related to PT infrastructure indicators per hub

6.5. PT satisfaction: traveller clusters

Moreover, respondents’ perceptions of PT systems in the 10 TInnGO hubs’ samples were segmented into three components: security aspects, infrastructure characteristics, and services integration or multimodality and five traveller clusters were identified, as observed in Figure 28.

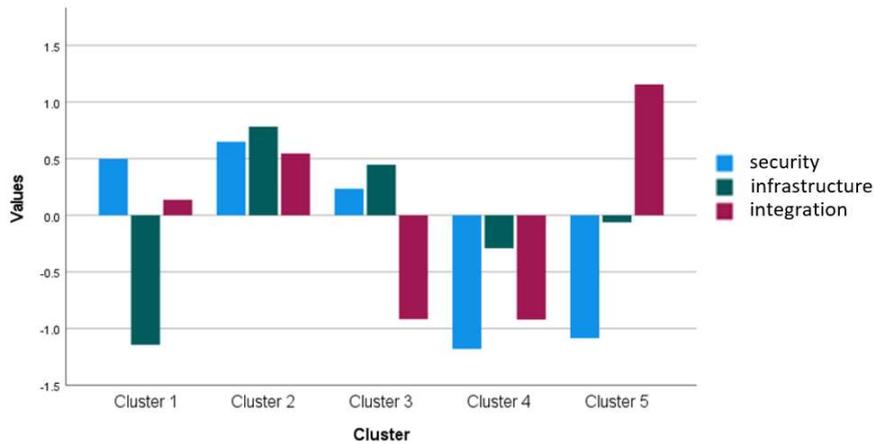


Figure 28 Level of satisfaction with the PT services for both men and women

The first cluster represents 22% of the respondents and indicates dissatisfaction with infrastructure aspects of the public transport. Security is perceived positively, and integration is not very impactful in the identity of this cluster. The participants belonging to this cluster were named the “infrastructure deprived” ones. Regarding the respondents’ socioeconomic characteristics and mobility behaviour, it is observed that 53.1% are women, there are many people older than 55 years old, there is a high percentage of dependents, and the majority has accessibility to the car.

The second cluster (27%) represents travellers satisfied with all the components compared to the other clusters. They have the highest mean in the infrastructure and security components. This cluster was named the “satisfied” ones. Overall, the participants in this cluster are satisfied with public transport, which is the best option available (mean = 4.17) and covers their travel needs (mean =4.28) and are the most familiar with ride-hailing and shared modes for non-work trips. The following socioeconomic and behavioural characteristics are distinguished in this case: the majority live in the urban environment (76.4%), there is a considerable share of people with income above average (26%) and 15% work remotely.

The third cluster, which consists of 22% of the total sample, are not satisfied with the integration and security aspects of public transport but have a good perception of the infrastructure characteristics. The respondents of this cluster were named the “integration seekers”. 54% are men, and 12% are younger than 24.

The fourth cluster consists of 15% of the sample and is not satisfied with any component of the public transport service. Compared with the first cluster, these respondents have a better perception of the infrastructure characteristics but the lowest perception of security aspects. These respondents had the lowest mean response to the statements “public transport is the best option I have available” and “public transport suits my travel needs”. This cluster was

characterised as the “dissatisfied” ones. 55.5% of the cluster are women, many young (15%), 34% are people with income below average, and almost 40% have had at least one harassment experience.

The fifth cluster (14%) includes respondents who are the most satisfied with integration aspects but have a very low average in the security aspects, similar to the “dissatisfied” ones’ cluster. The infrastructure component, in this case, has a lower impact. The travellers of this cluster were named the “security-lacking”. 56% are women, 26% have lower education levels, and almost 35% have an income lower than the average.

The perceptions of these travellers’ clusters indicate that: older people and people with dependents call for better infrastructure, young men seek integration in mobility services, and young women request improvements in security aspects. Additionally, residents in urban areas tend to be more satisfied with public transport features, while those living in rural areas tend to be overall dissatisfied. Moreover, bus users and low-income travellers have lower perceptions of security aspects, and previous negative experiences significantly lower security perceptions and may impact the overall perception of the service.

7. Private vehicles satisfaction from a gender perspective

When analyzing gender differences, no relevant gender differences, the satisfaction with private cars is very similar between men and women. The differences exist between genders within the different countries analysed. The survey used a Likert scale (1-completely disagree to 5-completely agree) to score the satisfaction with this mode of transport (Private vehicles) in different aspects.

The Greek sample has the lowest satisfaction levels regarding car usage, with women ranking it 2.27 and men 2.24, followed by the Scandinavian dataset results, with women's satisfaction scores at 2.40 and men at 2.58. On the opposite side, the French hub sample has the highest satisfaction levels regarding car usage, with women rating it 3.21 and men 3.25. Results are similar between genders and on average in five hub samples: Portuguese (2.85 for women and 2.83 for men), Italian (2.89 for women and 2.99 for men), Spanish (2.9 for women and 3.0 for men), UK (2.90 for women and 2.97 for men) and Baltic (3.02 for women and 3.00 for men). It should be noted that the German and Romanian datasets show, on the one hand, low satisfaction rates with private vehicles for women with 2.92 and 2.77, respectively and, on the other hand, high satisfaction rates for men with 3.17 and 3.00, respectively.

Regarding private vehicles indicators per hub, women in the Romanian dataset are less satisfied than men in almost all aspects, as presented in Table 30 that, if improved, could increase the level of satisfaction of women in this sample. However, the cost per parking and enforcement in parking and speeding restrictions are also aspects valued by the women in the German sample. Besides Romania, the "level of congestion when using a private car" was differently perceived by the two genders in the Scandinavian case. Moreover, women in the Italian and German hub samples feel that "the satisfaction with the convenience of interchanges" is relevant.

In general, men are more satisfied than women regarding private vehicles indicators, except in Italy, where the men surveyed were less satisfied than women with the "convenience of interchanges (main terminal) locations".

Private vehicles indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Convenience of interchanges (main terminal) locations		-0.254				0.378				
Availability and location of park and ride schemes									0.337	
Infrastructure conditions for parking (parking availability, payment method, the security of parking, etc.)									0.367	
Cost of parking						0.325			0.382	
Level of congestion when using a private car								0.398	0.563	
Existing enforcement of parking and speeding restrictions						0.378			0.495	

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 30 Mean difference in levels of satisfaction between men and women related to private vehicle indicators per hub

8. Active modes satisfaction from a gender perspective

Active modes were also analyzed across hubs using indicators to measure satisfaction levels per hub.

8.1. Walking indicators per hub

When comparing the results among the hubs, the satisfaction levels of pedestrians for most of the hubs are lower for women, except for the Romanian sample, where men are less satisfied than women, as shown in Table 31. There is a difference in the perception of safety between men and women in all hubs. Women are the pedestrians feeling more insecure and less satisfied with the provided infrastructure while walking on the streets. For the Italian, Spanish, Baltic, Portuguese, Scandinavian and UK samples, no significant differences were found between the two genders regarding walking.

Walking indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Access to public transport stops				0.325					-0.440	
Coverage of pedestrian routes				0.555					-0.376	
Security offered by pedestrian walkways	0.244			0.479					-0.309	
Easiness and security of connections between different modes of transport				0.365						
Level of safety walking on the streets	0.340		0.231	0.682		0.294			-0.377	
Information for pedestrians on signposts and maps (e.g.: remaining waiting time on crosswalks)		-0.328		0.347		0.408		0.281		
Location of subways and walkways				0.563	0.326					
Maintenance and quality of pavement	0.384			0.326					-0.319	

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 31 Mean difference in levels of satisfaction between men and women related to walking indicators per hub

Regarding the Baltic and Greek datasets, there are differences between men and women associated with the location of subways and walkways, as presented in Table 31. In the Scandinavian, Greek and German hub samples, women are less satisfied regarding the information for pedestrians on signposts and maps (for example: remaining waiting time on crosswalks), while in the Italian dataset, the ones unsatisfied with this aspect are the men. For the French, Spanish, Greek and German datasets, women as pedestrians feel more insecure and less satisfied with the provided infrastructure while walking on the streets. In contrast, in the Romanian sample, the men are more unsatisfied with this aspect than women.

8.2. Owned bicycle indicators per hub

Regarding satisfaction levels between men and women related to owned bicycle indicators, the analysis show that Baltic and Scandinavian Hubs present the highest values. On the opposite side, the Portuguese and the German hub register the lowest rate for this mode of transport. Only for some aspects of private bicycle use and only among Italian and Scandinavian respondents, relevant gender differences were found. In the Italian case, men show lower levels of satisfaction than women in aspects such as the bicycle paths infrastructure conditions, the conditions for sharing the space with other motorised vehicles, and the speed of vehicles in mixed traffic situations. In the Scandinavian sample, aspects such as “conditions of cycle lanes (cleanliness, quality of pavements, the width of cycle lanes)”, “level of information available before my bike journey”, and “speed of motorised vehicles in mixed traffic” were differently perceived by the two genders. The first two aspects, if improved, could increase the satisfaction levels of women. In contrast, the last aspect could increase the level of service perceived by men. Concerning shared bicycles, no significant differences were found between the two genders. When analysing gender differences for the French, Spanish, Greek, Baltic, German, Portuguese hub data sets, no significant differences were found between the two genders in aspects related to the use of owned bicycles.

Owned bicycle indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Ability to carry bicycles in public transport vehicles									0.166	
Ability to park bikes at stations										
Behaviour of motorist toward cyclist						0.334			0.196	
Conditions of cycle lanes (cleanliness, quality of pavements, the width of cycle lanes)		0.601						0.022	0.233	
Coverage of cycle lanes across the city									0.19	
Cycle parking availability and conditions (security, availability, etc.)									0.172	
Cycle safety during the trip (at junctions, at crossing)						0.367			0.214	
Easiness of connections with other modes of transport									0.204	
Level of information available before my bike journey								0.337	0.216	
Level of information provided for cyclist during the journey									0.19	
Conditions for sharing space with pedestrians									0.224	
Conditions for sharing space with cars, motorcycles and other vehicles of this type						0.316			0.205	
Speed of motorised vehicles in mixed traffic		0.618				0.401		-0.063	0.257	

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 32 Mean difference in levels of satisfaction between men and women related to owned bicycle indicators per hub

8.3. Shared modes indicators per hub

As explained in the chapter, shared modes are not widespread among the participants. No significant differences were found between the two genders in the French, Italian, Spanish, Greek, German and Portuguese hub samples, as shown in Table 33. Only for some shared modes' indicators in the Baltic and Scandinavian samples, gender differences were observed, as positive values indicate that women have lower satisfaction levels and negative values when men have lower satisfaction levels.

Shared modes indicators per hub	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Number of vehicles available										
Area of service (the area of service fit my needs)										
Comfort using shared modes (cleanliness, ...)					0.261					
Cost of use										
Easiness of connections with other modes of transport					-0.032					
Information provided in the platform					-0.326			0.281		
Level of information available before my journey					-0.202					
Connection to public transport					0.031					

Note: FR – French, IT – Italian, ES – Spanish, GR – Greek, DE – German, PT – Portuguese, RO – Romania, UK – United Kingdom

Table 33 Mean difference in levels of satisfaction between men and women related to shared modes indicators per hub

9. Mobility satisfaction models with a gender perspective

Passengers' satisfaction with public transport was analysed according to passengers' socio-economic characteristics through ordinal regression models with a gender perspective. Models for men's and women's satisfaction were developed to identify what affects the user's agreement with the statement "Public transport covers my mobility needs". Only complete responses were used to estimate the models, leading to a decrease in the datasets available that led to smaller sample sizes per gender. Nevertheless, the results obtained still reveal some relationships among the socio-economic characteristics and satisfaction levels and provide insights that could be further enhanced by analysing larger datasets.

9.1. French hub

According to the model estimates, it is noted that people belonging to the age group 25-34 believe that public transport is not the best mode they can use compared to older people. Also, living in the urban environment increases the probability of liking public transport as a basic mode compared to the residents of suburban areas. Income has also affected the respondents' replies, as it was indicated that people with higher income are less likely to state that public transport is the best mode they could use compared to people with lower income. Contrary to what was expected, gender, the number of cars, and licenses available at home did not affect people's perception of this aspect.

9.2. Spanish hub

The results also indicate that some socioeconomic characteristics can explain how public transport responds to the needs of the citizens. Specifically, it was shown that people living in the urban environment, in general, agree that public transport is the best mode choice available they have. People with children or other dependents in the household are less satisfied with public transport offers regarding their mobility needs. In this case, age and gender again did not contribute to the explanation of the satisfaction level. It should be noted that, in this sample, if a user belongs to the age group of 35-55 years old, it is likely that their mobility needs will not be covered by the public transport systems when compared to other modes. The same applies to users with dependents at home.

9.3. Baltic Hub

The analysis showed that higher-income women are less satisfied with public transport services than those with lower income levels in this region. Also, bearing the responsibility of physically or mentally impaired young, adult or elderly people can lower satisfaction levels. The equivalent model for men was not statistically significant ($p=0.306$), and no insights can be deducted.

9.4. German Hub

There is also some proof of the aspects that affect women's satisfaction with public transport in the German Hub. Specifically, as in other hubs, the income level negatively affects satisfaction. In this sample, the availability of a car or bicycle also plays a role, negatively affecting satisfaction. The presence of dependents also lowers the probability of being satisfied with public transport provision. There is also proof that the urban environment affects satisfaction as women living in urban areas tend to have higher satisfaction levels than suburban and rural ones. There was not enough evidence on the aspects that affect their satisfaction for men as the model was not statistically significant ($p=0.350$). More data is necessary to achieve more reliable results in this case.

9.5. Portuguese hub

In the Lisbon hub, women's satisfaction with public transport was higher for younger women. In contrast to other hubs, lower-income women had lower satisfaction levels than average in this sample. These results might reflect accessibility issues that affect the satisfaction perception of lower-income women. In literature, lower-income people are associated with higher satisfaction levels. In this case, the responsibility of dependents is affecting satisfaction but not in a homogenous way. There is a high negative impact when men travel with preschool-age children (under five years), less negative when they travel with physically or mentally impaired young, adult or elder and less negative when they are with elderly relatives. On the contrary, when they are with children in the early school age (5-10 years), satisfaction is affected positively.

9.6. Scandinavian Hub

For the Scandinavian hub, the model for men indicated that higher levels of car acquisition and commuting by car negatively affect satisfaction with public transport. In contrast, commuters with public transport are more likely to be positively satisfied with the service. For the analysis

of women, there was no valid model obtained ($p=0.528$), and for this reason, there is no conclusion on the aspects that may explain satisfaction levels.

9.7. Other hubs

For the Italian and Greek samples, there were no statistically significant results on the socioeconomic aspects that can affect citizens' satisfaction with the connectivity offered by the public transport system. Due to time-frame constraints, data were not analysed for the UK and Romanian hubs.

10. Improvements on PT infrastructure and services from a gender perspective

This section aims to analyse different groups' perceptions of potential improvements in the existing transport system by asking users to express their opinion on the effectiveness of some measures and the introduction of new technologies in the PT systems. The perception of improvements in mobility for each agent was evaluated, and the differences between genders are presented below. It should be noted that there were no sufficient replies from non-binary and transexual participants in the 10 TInnGO hubs' sample; thus, only men and women data were analysed.

10.1. PT improvements: gender differences

The most popular measures for men and women to improve PT in these samples were related to surveillance cameras onboard, at stations and stops, integration/ multimodality features. Nevertheless, there are differences in gender regarding the level of importance of the four measures. On the one hand, women gave more importance to surveillance. On the other hand, men appreciated more multimodality and integration with a smartphone application, as shown in Figure 29.

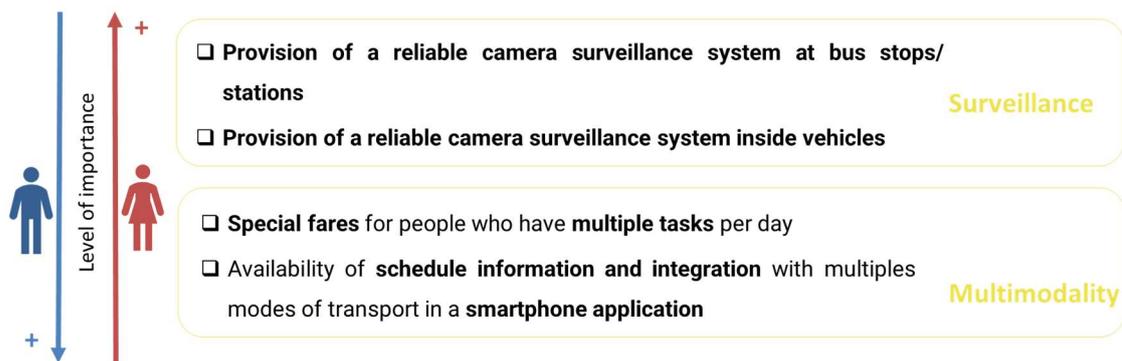


Figure 29 Top features to improve PT for both men and women in the majority of the hubs

Furthermore, the data collected showed that men and women perceive improvements differently to enhance mobility experiences. In particular, the following measures are statistically higher appreciated to improve women's mobility experiences ($p < 0.05\%$):

- PT infrastructure
 - Increase Space (2 measures): for children, trolleys, and wheelchairs.
 - Improve Accessibility (1 measure): between sidewalk and bus stops, train and metro stations.

- Increase Security (5 measures): Provision of panic or alarm buttons at bus stops, stations and onboard; reliable camera surveillance system at bus stops, stations and onboard and emergency telephones at bus stops and stations.
- PT services
 - Increase Flexibility (1 measure): adjust routes according to passenger needs.
 - Increase Integration/ Multimodality (3 measures): schedule information and integration with other modes available at bus stops and stations and in a smartphone application; special fares for multiple trips per day.

As it is observed, nearly half of the measures are related to improvements on security and surveillance aspects in the PT infrastructure and a quarter with enhancing accessibility to PT stations and stops and space onboard. The remaining one-third aimed to enhance PT services by customising fares and routes and allowing multimodality integration with other modes.

10.2. PT improvements: traveller clusters

Travellers perceptions were also assessed concerning possible future interventions to the public transport systems. Three components were identified for the French, Italian, Greek, Spanish, Portuguese and Scandinavian hubs: enriched public transport services, customization and space dedication. Based on the respondents' replies, four traveller clusters were designated and described in Figure 30.

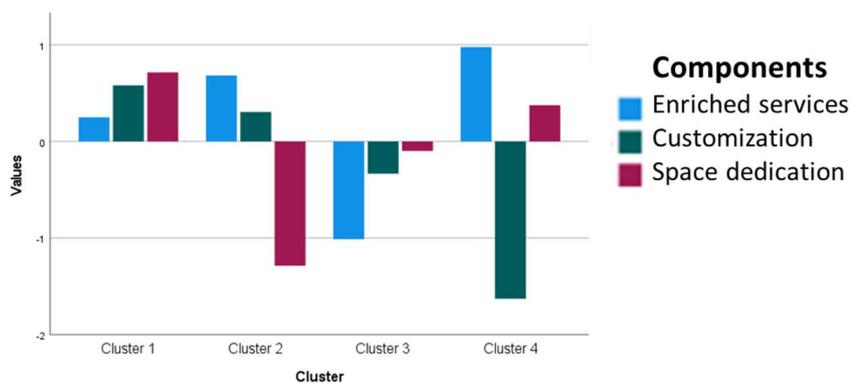


Figure 30 Perceptions on new features of public transport services for both men and women

The first cluster is composed of 36% of the respondents who state that the introduction of changes in all three components is effective for improving the public transport experience. These were called the “Game-changers”, and their main socioeconomic characteristics are presented below:

- Gender: Balanced
- Income: 77% with average and above-average income
- Age: 45% between 25-44 years old (highest), 8% below 25 (the lowest)

The second cluster expresses travellers who find changes in security and customization aspects important but do not think space dedication requires adjustments. These are 21% of the total sample, and they were named the “Service and customization-oriented”. For them, security changes are more important than the introduction of customization. Their characteristics are presented below:

- Gender: Balanced
- Income: 30% below average
- Age: 17% younger than 25 (the highest)

The participants in the third cluster do not think that changes in any of the three components are necessary. They are 33% of the sample and are named the “Game-keepers”. Their characteristics are presented below:

- Gender: More men than women for Paris and Valencia
- Income: 30% below average
- Age: 46% between 34-55

Finally, the last cluster entails 10% of the respondents and are focused on security and space, giving lower importance to customization. This cluster was named the “Service and space-oriented”, and the following socioeconomic characteristics distinguish it from the other clusters:

- Gender: Balanced
- Income: 50% below average
- Age: Highest % of people above 55

In this clusters analysis, approximately one-third of the sample would be satisfied with the “business-as-usual” state in public transport services. Another third would like to have changes in all the levels. The other third would like to have targeted changes that would satisfy specific needs of infrastructure provision, customization in services and security.

11. Intelligent Transport Systems from a gender perspective

In the mobility survey, users were asked to express their opinions about autonomous vehicles and shared modes, and different perceptions were detected among genders.

11.1. Autonomous vehicles

When assessing the opinion of men and women regarding different characteristics related to autonomous vehicles, results showed divergences between men and women’s perceptions. On the one hand, men tend to associate autonomous vehicles with positive aspects. On the other hand, women tend to associate it with negative aspects, as shown in Figure 31.

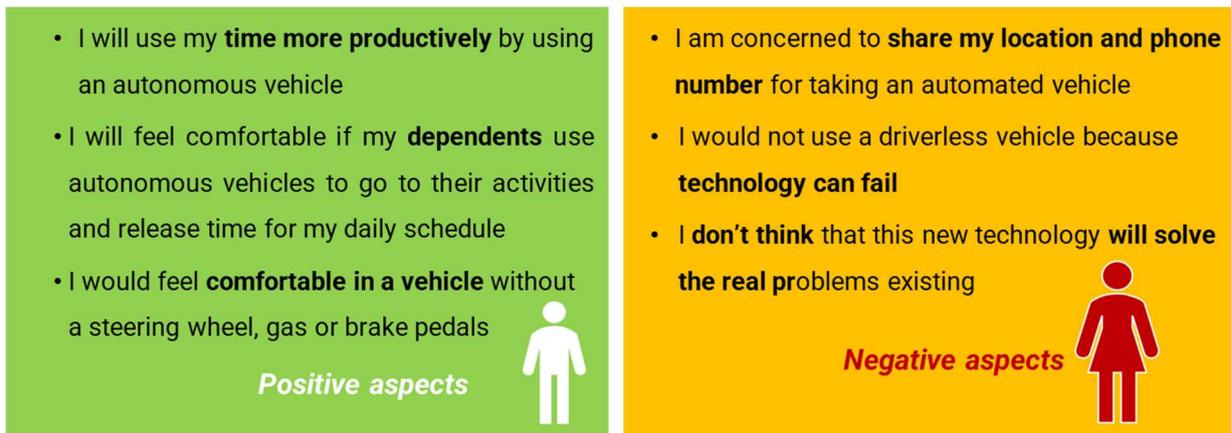


Figure 31 Different aspects of autonomous vehicles from a gender perspective

Additionally, differences were found between genders and age groups, as shown in Table 34.

Autonomous vehicles indicators	Gender differences
I would feel safer if I could use autonomous vehicles for my mobility	(1) older men rated higher this impact compared to younger ones but lower than all women’s age groups (2) no differences found among women’s perceptions
Autonomous vehicles will make my mobility experience easier	(1) older men rated higher this impact compared to the younger ones but lower than all women’s ages (2) no differences found among women
I will use autonomous vehicles to travel with my children to their activities	(1) older men have higher means than younger men (2) men have higher means than women in all ages
I will use my time more productively by using an autonomous vehicle	(1) older men (65+) rated higher this measure compared to younger ones but lower than all women (2) among women, women above 45 agree more with this statement compared to younger women

Table 34 Levels of satisfaction between men and women related to autonomous vehicles

11.2. Shared vehicles

When assessing the opinion of men and women regarding different characteristics related to shared vehicles, results showed divergences between men and women's perceptions and amongst age groups, as presented in Table 35.

Shared vehicles indicators	Gender differences
Transforming docked shared bicycles systems in dockless systems	(1) this measure could have an impact on the experience of older women.
Increase the number of locations with dock stations for shared bicycles	(1) the oldest male participants gave higher ratings to this measure compared to all the others. (2) among women, this measure got higher average rates as age increases.
Special fares for people who have multiple activities and need to use different modes of transport per day	(1) older men compared to all the other men-age intervals had higher mean in their replies. (2) older men had lower means compared to young women (3) among women, older women rated the utility of this measure higher than the younger ones.
I will never use shared modes in my city	(1) older men (55+) are more likely to never use shared modes compared to younger men and women. (2) older men had a lower average compared to young women.

Table 35 Levels of satisfaction between men and women related to shared vehicles

12. Conclusions and recommendations

12.1. Mobility patterns from a gender perspective

Mobility policies should consider an intersectional approach to achieve more equitable transport and mobility solutions. It should be highlighted that due to the lack of sufficient replies from non-binary and transexual respondents in the 10 TInnGO hubs' sample, only men and women mobility patterns and behaviours were analysed.

Some common trends are observed in these samples. Travellers behaviour show a **preference for traditional transport modes such as cars and public transport.** The use of **bicycles is not yet prevalent, and the shared modes are not widespread.** Moreover, it was observed that, on average, in the datasets analysed, **women travel shorter distances and take longer to arrive at their destination.** Furthermore, **the car is the most popular transport choice regarding respondents' most frequent journeys, with men as drivers and women as passengers,** with the biggest differences between genders as drivers and passengers observed in the Italian, Spanish and Portuguese hub samples. Another trend observed is that **women use more public transport in most samples than men.** It is worth highlighting the low levels of use of public transport (PT) by men in the Greek and Italian samples and the high levels of car usage in the Italian and Greek datasets for both genders. In the case of the French, Portuguese and Spanish hubs, people have reported higher levels of public transport use in their most regular trips.

Furthermore, in most datasets analysed, **the number of stops along the main journey is higher for women.** Even though the **gender differences in mobility are slowly closing, results show that most women make intermediate stops for shopping and men for leisure and work/study reasons.** Moreover, **the gap is decreasing in terms of travellers' behaviour when escorting dependents, except for the Greek and French samples,** which presented the biggest differences between genders, with women travelling more with dependents than men. Regarding the choice of mode of transport for **people who travel with the dependents,** it was possible to see that in most of the datasets, **both genders choose private vehicles. Biking and PT are less preferred modes when travelling with dependents, which may be evidence of low accessibility to public transport** for the vulnerable population (disabled, elderly or children).

12.2. Harrassment experiences as travellers

Data on harassment was collected through the mobility survey, and answers were analysed simultaneously for the following six metropolitan areas (MA) datasets: Paris MA (279 answers), Turin MA (420 answers), Thessaloniki MA (231 answers), Valencia MA (442 answers), Lisbon (373 answers) and Malmo MA (210 answers). The results from the other 4

TinnGO hubs (Germany, Baltic countries, Romania, the UK) were analysed separately, mainly due to time-frame constraints and data limitations.

In total, **1955 replies were collected, and 372 respondents stated they had a harassment experience as travellers**. In these samples, the percentage of harassment incidents ranged from 6 (Valencia) to 39% (Malmo). The rates vary across the hubs, but **there is evidence that some MA that have taken measures to increase security had lower harassment rates such as Valencia**. However, a **relatively low percentage of travellers has reported** the incident, from 17% (Malmo) to 35% (Paris), giving an average of **only 21% of these incidents reported**. In these six MA, the **most voted reasons for underreporting are mistrusting the police and undermining the importance of the incidents**. When looking at the gender distribution among the incidents, it is seen that overall, people from all age groups have experienced harassment as PT users; however, there are more harassment incidents among women than men, 17.45% and 14%, respectively. In addition, it was observed that **low-income people had informed 35% of the incidents** in these samples.

In most datasets, the **respondents who have had a harassment experience feel less secure onboard, at the stations and stops, and are afraid of being harassed again**. Furthermore, these samples **show a tendency regarding people who have experienced harassment as PT users. This group is less optimistic about the effectiveness of new measures to improve their public transport experience. Overall, only changes in the feeling of security are relevant for this segment**.

12.3. PT infrastructure and services from a gender perspective

Understanding the needs of all can lead to inclusive transport systems and mobility services that provide adequate services, at the right time, at the right place, supporting mobility for all genders and age groups. It should be highlighted that only men and women mobility perceptions towards PT were analysed due to the lack of sufficient replies from non-binary and transexual participants in the 10 TInnGO hubs' sample. **Men have higher rated security aspects in PT compared to women**. The analysis indicated that women feel less secure waiting for public transport while onboard and parking their cars at intermodal stations. **The feeling of crowding is also different between genders. Women feel less satisfied with crowding and less safe when many people are gathered at waiting areas or onboard**. When analyzing the **accessibility of public transport areas, women also have much lower satisfaction rates**. Specifically, women are less satisfied with the following aspects:

- accessibility of station facilities
- accessibility of ticket offices for those with communication/language problems

- announcements of transport stop names or use of recorded announcements
- availability and suitability of priority seating
- number of disabled-friendly facilities on vehicles

Moreover, respondents' perceptions of PT systems in the 10 TInnGO hubs' samples were segmented into three components: **security aspects, infrastructure characteristics, and services integration** or multimodality and **five traveller clusters** were identified. The perceptions of these travellers' clusters indicate that: **older people and people with dependents** call for **better infrastructure**, **young men** seek **integration in mobility services**, and **young women request improvements in security** aspects. Additionally, **residents in urban areas** tend to be **more satisfied with public transport features**, while those **living in rural areas tend to be overall dissatisfied**. Moreover, **bus users and low-income travellers** have **lower perceptions of security aspects**, and **previous negative experiences significantly lower security perceptions** and may **impact the overall perception of the service**. Overall, **respondents' perceptions in the 10 European datasets analysed - regarding PT systems' security aspects, infrastructure characteristics, and integration/multimodality** show that **only 27% (nearly one-third) are satisfied**. At the same time, **15% are completely dissatisfied with all the aspects** of the PT systems. Furthermore, **the rest of the respondents are not satisfied with at least one of the PT components: 22% are not satisfied with integration and security aspects, 22% are not satisfied with the infrastructure characteristics, and 14% are not satisfied with the security elements**. In this context, the mobility satisfaction models (ordinal logistic regressions)² were developed to analyze the satisfaction of men and women in each hub. The results may vary across the hubs, but a tendency is identified in the satisfaction levels regarding PT. **In most of the hubs, it was observed that the level at which women's needs are covered by public transport was negatively affected by dependents, car ownership, household location, and accessibility to a bicycle**.

Active modes were also analyzed. In the **case of bike usage, the recommendations are not gender-oriented as all users require safer infrastructure and request a review of the driving culture of drivers of other modes**. Furthermore, in order to **satisfy and encourage more women of all ages to use the bike it is necessary to improve bike parking conditions, connectivity to the public transport network and infrastructure** in terms of its **maintenance and lane space**.

² It should be noted that the data set showed relations and tendencies regarding gender, travelling with dependents and age. However, the sample size does not allow to have statistically strong conclusions.

12.4. Improvements on PT infrastructure and services from a gender perspective

Moreover, participants were asked about **new measures to improve public transport services and policies, to achieve more equitable transport and mobility solutions**. It should be noted that there were no sufficient replies from non-binary and transexual participants in the 10 TInnGO hubs' sample; thus, only men and women data were analysed. The **most popular measures for men and women to improve PT** in these samples were related to **surveillance cameras onboard, at stations and stops, integration/ multimodality features**. Nearly **half** of the measures are related to **improvements in the PT infrastructure's security and surveillance aspects** and a **quarter** with **enhancing accessibility to PT stations and stops and space onboard**. The remaining **one-third** aimed to enhance PT services by customising fares and routes in addition to allowing multimodality and integration with other modes. Nevertheless, there are differences in gender regarding the level of importance of the four measures. On the one hand, **women gave more importance to surveillance**. On the other hand, **men appreciated more multimodality and integration with a smartphone application**.

Travellers perceptions were also assessed concerning possible **future interventions to the public transport systems**. Three components were identified for the French, Italian, Greek, Spanish, Portuguese and Scandinavian hubs: enriched public transport services, customization and space dedication. Based on the respondents' replies, four traveller clusters were designated. It showed that approximately **one-third of the sample would be satisfied with the "business-as-usual" state in public transport services**. **Another third would like to have changes in all the levels**. The **other third would like to have targeted changes** that would satisfy **specific needs of infrastructure provision, customization in services and security**.

Given the current competition that public transport faces with the advent of ride-hailing services in many European cities, on the one hand, **the introduction of flexibility in public transport can be a measure to keep its market share and satisfy user needs**. On the other hand, **PT operators could start working with those companies to complement the offer** in places where PT infrastructure and services do not meet peoples' needs.

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14. Annexes

Annex I – Samples' overall statistics

I.1 Gender

Hubs	Women	Men	Non-binary/NA
Baltic	49.32%	50.45%	0.23%
German	50.00%	48.79%	1.21%
Greek	55.14%	44.86%	0.00%
Italian	49.29%	50.71%	0.00%
French	53.00%	47.00%	0.00%
Portuguese	50.46%	48.92%	0.62%
Romanian	55.60%	43.64%	0.76%
Scandinavian	45.63%	52.18%	2.18%
Spanish	49.55%	50.45%	0.00%
UK	34.02%	64.42%	1.55%

Table 36 Distribution of the population in the samples per gender per hub

I.2 Age groups

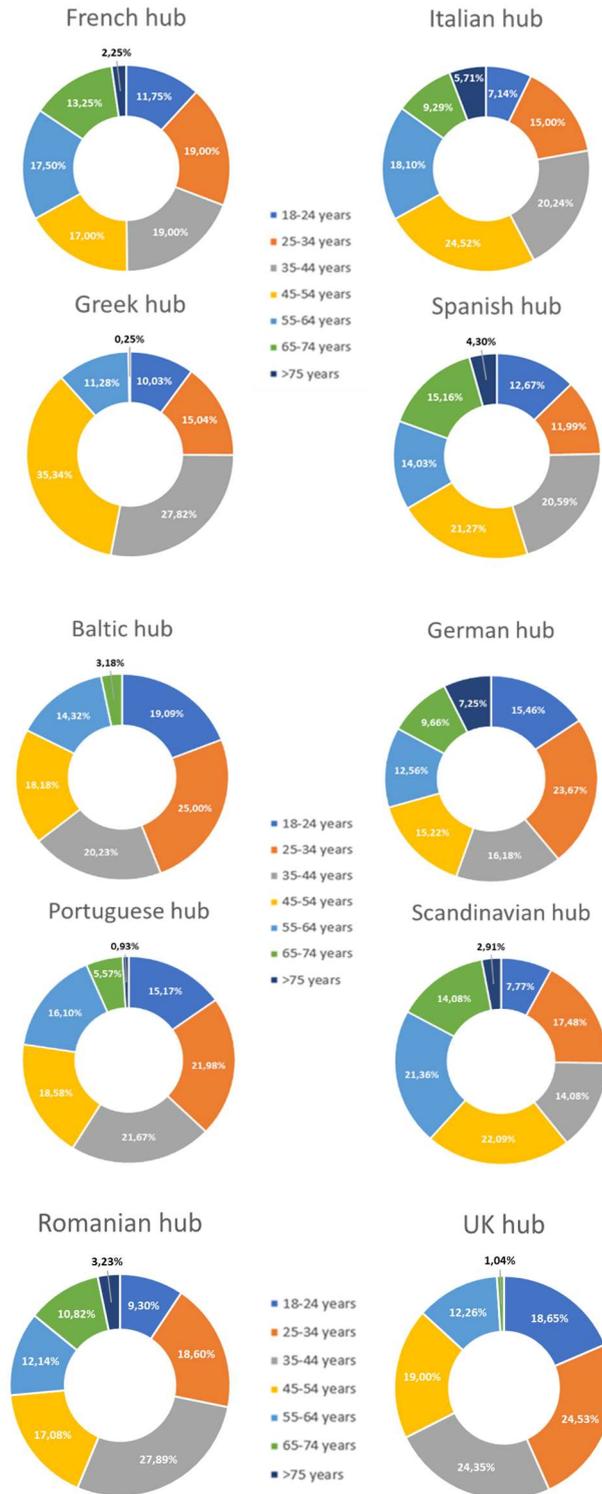


Figure 32 Distribution of the population in the samples per age group per hub

I.3 Type of disabilities

Type of disabilities	FR	IT	ES	GR	Baltic	DE	PT	Scandinavian	RO	UK
Mobility impairment	2,5%	3,6%	5,0%	0,8%	5,2%	8,2%	0,9%	5,8%	3,4%	6,0%
Hearing impairment	3,5%	1,9%	2,7%	0,0%	2,1%	7,0%	2,2%	5,3%	0,6%	4,3%
Visual impairment	9,3%	5,7%	3,9%	1,0%	7,7%	9,2%	3,7%	2,9%	2,5%	5,2%
Speech and communication impairment	1,5%	0,5%	0,5%	0,0%	0,9%	1,5%	0,3%	0,7%	0,2%	1,6%
Learning impairment	1,3%	0,2%	0,7%	0,5%	0,7%	1,0%	0,0%	3,6%	0,4%	2,9%
Serious long-term illness	7,0%	3,1%	4,1%	3,5%	5,7%	7,0%	1,9%	5,3%	1,3%	5,2%

Table 37 Distribution of the population in the samples by type of disability per hub

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