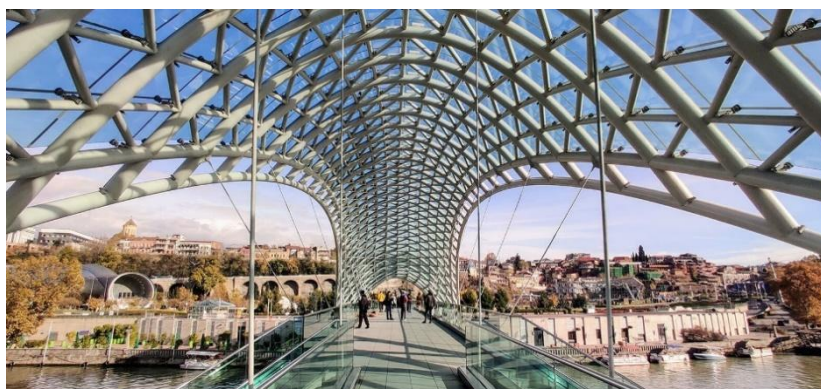




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Data Collection and Model Update Related to Transport in Tbilisi

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HHS Report

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ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
BPR	US Bureau of Public Roads
CAPI	Computer Assisted Personal Interviewing
EA	Executing Agency
ED	Effective Date
FSU	Final Sampling Unit
GAP	Gender Action Plan
GBV	Gender-based violence
GIS	Geographic Information System
GPS	Global Positioning System
HH(s)	Household(s)
HHS	Household Survey
HTS	Household Travel Survey
IA	Implementing Agency
O/D	Origin and Destination
PT	Public transport
PWDs	People with disabilities
RRP	Random Route Procedure
SPSS	Statistical Package for Social Science
SrV	System of Representative Travel Surveys
SSU	Secondary Sampling Unit
TAZ	Transportation Analysis Zone
TDF	Tbilisi Development Fund
TCH	Tbilisi City Hall
ToR	Terms of Reference
TUDA	Tbilisi Transport and Urban Development Agency

1 INTRODUCTION

The assignment titled “**Data Collection and Model Update Related to Transport in Tbilisi**” funded by ADB and implemented with the Tbilisi City Hall (TCH), Executing Agency (EA), and Tbilisi Development Funds (TDF), Implementing Agency (IA), via the Tbilisi Transport and Urban Development Agency (TUDA) (hereafter “The Client”), collected data reflecting citizens’ transport habits and update the transport demand model to improve transport services within Tbilisi contributing to the promotion of sustainable urban transport network.

The contract for this assignment has been awarded to the Consortium led by Lattanzio KIBS with REDAS Engineering and ACT Global (hereafter “The Consortium”) in July 2024. The Contract came into force and effect on 1st July 2024, date set out as Effective Date (ED).

The specific objectives of the assignment are to:

- Carry out an **update of the Household Survey (HHS)** done in 2016, which would help in updating the knowledge on the travel habits of the citizens of Tbilisi (Task 1).
- Conduct **additional manual data collection**, including surveys on public transport, so that it can adequately support the definition, evaluation, and possible implementation of mobility management policies in line with the recently developed Tbilisi Transport Plan (SUMP) (Task 2).
- Update the **Tbilisi Transport Demand Model** (Task 3).
- Conduction of **Capacity building** activities on the updated model, to provide knowledge-transfer and training to the Client’s technical team (Task 4).

This document describes the **HHS Implementation and Summarized Results** and falls under Task 1: Update of the 2016 Household Survey (HHS). Indeed, it provides information on Survey Methodology (section 2), Survey Implementation (section 3), Data Processing (section 4), Outcomes, Results and Deliverables (section 5), Challenges and Mitigation Measures (section 6) and Lessons Learned (section 7).

The main implementer of the HHS was ACT Global (ACT), Georgian member of the Consortium.

2 HHS METHODOLOGY

The chapter of methodology describes HHS goals and objectives, general methodological approach, sampling strategy and final zonal structure.

2.1 OBJECTIVES

The main objective of the HHS was investigating the travel habits and patterns of people living in Tbilisi, including residents and domiciled, to properly and efficiently support the activity of Task 3. More specifically, the HHS aimed at collecting data concerning:

- Socio-economic and demographic characteristics of the population that could have an influence on mobility patterns.
- Any data deemed necessary for describing and detailing travel habits of sampled respondents.
- Precise information about factors that could influence the travel habits of people.
- Collect relevant information to support the development of policies and measures that ensure inclusion, specifically focusing on universal accessibility and gender equality.

It was planned to gather a comprehensive and reliable database describing the actual mobility demand in Tbilisi. Any detailed data of the database will be used to update the transport demand model and to support any modelling exercise deemed necessary to estimate the impact of possible interventions on the transport systems in Tbilisi.

2.2 GENERAL METHODOLOGICAL APPROACH

As reported in the Survey Plan, in order to reach the above mentioned goals, the HHS was conducted in Tbilisi, in the City of Rustavi, in the municipality of Gardabani, in the municipality of Mtskheta as well as in the following suburban areas: Kojori, Tsavkisi, Shindisi, Tabakhmela, Lisi, Mukhatskaro, Napetvrebi, Mskhaldidi, Bevreti, Nakshigora, Tskluleti, Mukhatgverdi, Saguramo, Natakhtari, Tserovani, Norio, Martkopi, Vaziani, Kumisi, Karajalari (detailed information is provided in 2.3).

The Consortium deployed a quantitative survey approach aiming at obtaining primary data from 10.000 randomly selected HH in primarily defined transport microzones – from all HH members above 14 years old.

The preliminary defined number of microzones was 520 with the assumption of increasing their number after receiving final data on the population. After processing the data, 564 microzones were defined. Finally, the number of microzones was reduced to 557 as some of zones turned out to be non-residential and/or industrial. Moreover, in all remaining zones, difficulties to conduct interviews raise concerns, therefore the number of zones where interviews were conducted reduced to **527** (for detailed information, see 2.4 Final Zonal Structure, Table 1).

As explained in the Inception Report and Zonal Definition, a Transportation Analysis Zone (TAZ) was a basic geographic unit used in transport modelling and planning to analyze mobility patterns and travel habits. TAZs divided the area under study, namely the city of Tbilisi and its adjacent territories having daily correlation with the city from a mobility perspective, into zones that group residential areas, workplaces, and many other relevant land-uses. This process allows the modelling procedures and support to estimate and forecast mobility flows between any locations. Zones and Microzones were identified, based on the following criteria: administrative boundaries, natural and

structural boundaries, functional purpose of the territory (land use), and geometric forms and population¹.

The **main objective** of the survey was to obtain information about travel habits through recalling the experience of trips the day before or two days before the interview (in case there was no travel experience on the previous day)². Sunday and Monday were not included in days for fieldwork, to capture travel experience on a typical working day.

For data collection, face-to-face interviews were conducted using **CAPI technology**. In exceptional cases, upon the request of the respondent, some interviews were conducted by telephone.

2.3 SAMPLING STRATEGY

Random stratified sampling approach was applied for the HHS. Pre-defined microzones served as strata, within which respondents were randomly selected.

Random stratified sampling offered significant advantages in terms of precision, subgroup representation, resource efficiency, and control over sample composition. These benefits are particularly valuable for complex surveys, where detailed analysis and accurate representation of diverse subgroups are critical.

The sampling was arranged in the following stages and steps:

Stage 1: Identification of microzones eligible for the survey (residential/non-industrial);

Stage 2: Identification of starting points within each microzone:

- In each microzone, 2 or 3 points were randomly selected using GPS mapping. The number of points were defined according to the scale of zone (territory and population). The selected points ensured that information was collected from a wider geographic area.

Stage 3: Households Selection via Random Route Procedure (RRP):

- On each selected point, addresses were identified randomly.
- Different sampling intervals for household selection were identified according to the settlement type: every 5th household in urban settlements and every 3rd household in rural settlement (after successful interviews). In case of unsuccessful interviews, the instruction was to replace the household with a neighboring address/household.

There was no procedure of selecting a final sampling unit – respondent - as all respondents 14+ were appropriate for the survey.

Stage 4: Traffic Route and Rules:

- Guidelines and map links for each point were prepared for interviewers, tailored to each settlement type.

Since the exact information regarding the population number in microzones was not available³, it was decided to distribute the number of interviews equally across the microzones – 18 households

¹ *Inception Report_Zonal Definition*

² Initially, the plan was to collect information on the respondents' trips taken the previous day. After analyzing the data collected during the first three weeks (following the agreed fieldwork suspension), it was decided to gather information about the day before the previous day too—if no trips were made the previous day—and to increase the number of reported trips in order to provide a richer basis for analysis.

³ The most recent National Census Data dated back to 2014 and did not align with the specific zoning of the project.

in each. The challenges of completing interviews with 18 households, due to the small population of some microzones and other possible reasons, are presented in Section 2.4.

2.3.1 Ensuring inclusion and correct representation of people with disability

To ensure the quality and reliability of the transport model update, it was crucial to include people with disabilities (PWDs) in the sampling. Adequate participation of PWDs to the survey was guaranteed by implementing key measures aimed at ensuring:

- a **correct identification** of all categories of PWDs by the interviewers due to comprehensive list in the specific section/questions of the questionnaire;
- an **equity and inclusion approach** and the use of an inclusive and appropriate terminology during the interaction between interviewers and PWDs respondents;
- **full participation** and high-rate of response from PWDs reached by the survey;
- **representation of PWDs in the sample**, trying to reflect the share in the total population of Tbilisi that, based on data from the National Statistics Office of Georgia 2014, is about 2,12%.

The fact that interviewers collected data in-person prevented the need to accommodate mobility challenges.

In addition, so-called *proxy interviews* were conducted in households where a third party participated in the interview on behalf of the household member with disability. For example, if the selected respondent was a person with disability and was typically accompanied by other household members when using transport, the appropriate accompanying member was inquired. In such cases, the sampling remained random and was not purposive.

All the foreseen measures preventing PWDs exclusion from the data collection process, provided an accurate and representative picture of all households in Tbilisi. The adopted inclusive approach not only improved the quality of collected data but also contribute to a more equitable and socially just process.

Given the official percentage of PWDs among Tbilisi HHs, it was challenging for random sampling to capture such a small share. However, owing to the strategy described above and the efforts of skilled enumerators, the survey gathered information from individuals, accounting for 7% of respondents, **who identified themselves as people with disabilities or other specific conditions affecting mobility, even if temporary**. c.

2.4 FINAL ZONAL STRUCTURE

Before the starting fieldwork, 564 microzones in Tbilisi and surrounding areas were defined for project purposes. The fieldwork process revealed that in some zones the number of populations was smaller than expected or they were non-residential at all. As a result:

- non-residential zones, those that were industrial or uninhabited and lacked neighboring microzones suitable for the survey were removed from the sample;
- in small zones or zones without a resident population but with suitable neighboring areas, interviewers were reassigned to adjacent zones with larger populations.

In total, out of 564 microzones:

- Interviews with 18 households were conducted in 311 microzones (in each), as planned.
- In 128 microzones (in each), more than 18 interviews were conducted, primarily due to the redistribution of interviews from other zones.

- In 60 microzones (in each), between 10 and 17 interviews were conducted.
- In 28 microzones (in each), fewer than 10 interviews were conducted.
- Seven microzones (microzones #173, 383, 598, 636, 652, 665, and 670) were removed without interview redistribution, as they were identified as initially non-residential or unpopulated and without neighboring areas appropriate for the survey
- For the microzones listed below, interviews were redistributed to other zones due to various reasons, such as extremely small populations, uncooperative attitudes, presence of locked summer houses, non-residential designation, industrial use, educational institutions, cemeteries, etc. (see the table below.)

Table 1 - Redistribution of Interviews in other zones

Zones with few or without Interviews	Number of Completed Interviews	Zones where interviews were redistributed
121	1	603
170	0	169
171	0	167-168
249	0	600
250	0	528
254	0	253
259	0	262
305	0	531
307	0	304
321	1	320, 337
329	0	510
338	0	290
376	2	360
380	0	366
381	0	95
387	0	372
395	0	399
412	0	467
419	0	314
440	6	666 ⁴
441	0	252
442	0	529
444	0	530
448	0	407
449	0	406
475	0	600

⁴ After GPS verification, 12 out of 18 interviews conducted in microzone 440 were found to be located in microzone 666, which had initially been classified as industrial.

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Zones with few or without Interviews	Number of Completed Interviews	Zones where interviews were redistributed
490	1	not redistributed ⁵
493	0	326
513	0	88
514	0	82
517	0	396
533	3	251
535	0	73
537	1	227, 604
539	0	34
559	0	not redistributed
581	0	112

⁵ At the end of the survey, it was decided not to redistribute interviews from microzones 490 and 559. This decision was based on two factors: first, the capacity of other zones had been depleted; and the number of surveyed households had already exceeded 10,000.

3 HHS IMPLEMENTATION

This chapter describes the preparation of the survey instruments and its piloting, recruitment and training of the staff, data collection and quality control activities, as well as call back procedure.

3.1 SURVEY INSTRUMENT

The HHS's questionnaire was based on a general approach, such as in SrV⁶ and was created starting from the previous 2016 HHS to allow comparisons of variables with previous results. However, as it was important to receive a satisfactory response rate, it was decided to keep those questions that are of key importance to the model, add further questions improving the evaluation of all trips of previous day, and include questions related to gender and people with disabilities-related policies in the relation to mobility habits of Tbilisi residents.

Summarizing, the first version of the household questionnaire consisted of several parts:

- Part 1: General questions to the head of the household⁷:
 - Demographics – several questions on demographic and economic status for the whole household
 - Vehicles in household – assessment of what private vehicles of different types (cars, motorcycles, bicycles, e-scooters) are available for the members of household.
- Part 2: Questions on mobility and general socio-economic characteristics – for each household member of more than 14 years old.
- Part 3: General questions on personal data and mobility practices and issues – which include collecting information about gender, age, driving license, occupation, key criteria of choosing mode for travel, car availability; as well as questions requested by the Client on safety in public transport, harassment, and evaluation of barrier-free infrastructure for people with disabilities or mobility impairments.

Moreover, Part 3 included some specific questions to investigate frequent trips made for work purposes, such as couriers, taxi drivers, nurses, postal workers etc. This information is extremely important, as such frequent trips constitute a significant part of overall mobility demand and must be properly considered in the model. Also, considering them is important as respondents often tend to omit details about these trips (origin and destination, start and end time, etc.) when reporting their daily travels. These trips can be categorized as 'work trips' during model calculations, as informed by the general information provided in Part 3 of the questionnaire. .

- Part 4: Personal trips of a previous workday – including detailed characteristics of trips of previous day, such as travel time, time of start and end of the trips, trip zones for both trip ends, trip purpose and modes used, and number of people within car for car-based trips.

Information collected in Part 4 and partly in Part 3, was required to define OD-pairs, describing spatial distribution of trips between any (microzone of) origin and any (microzone of) destination, Modal split, Demand strata distribution, Utility functions and Generation-Attraction rates, and average car-occupancy for transport modelling process.

⁶ https://tu-dresden.de/bu/verkehr/ivs/srv/srv-2018?set_language=en

⁷ Filter question: "How long have been you living in the neighbourhood?" - to assess only those who live at the surveyed place for more than 6 months, as they could have consolidated their own travel habits.

3.2 RECRUITMENT AND STAFFING

The following table summarizes the staff members of the Consortium involved in the completion of the HHS and their main responsibilities.

Table 2 - Staffing

Position	Responsibility
Team Leader	Responsible for the overall project implementation, elaboration of study approach, and supervision of involved parts.
HHS Team Leader	Responsible for implementation of HHS
Statistician/Sampling specialist	Responsible for sampling strategy
HHS Field Manager	Responsible for HHS data collection and control procedures
Supervisors	Responsible for the performance of interviewers
Enumerators	Responsible for collecting data from households
CAPI Assistant	Responsible for technical support during HHS completion on-field
Database Specialists	Responsible for preparation of cleaned database and outputs
Quality control and revision specialists	Responsible for control of data quality and consistency
Coding specialists	Responsible for coding open-ended questions

Apart from the Team Leader, any other staff member described in the table were ACT staff and they were skilled and experienced in the appropriate field.

With the supervision of the HHS Team Leader, several internal technical meetings with key and non-key experts of the team were organized to assign:

- (1) tasks to the team members dedicated to the HHS;
- (2) responsibilities for the on-field activities of the HHS.

The **HHS Team Leader**, responsible for supervising any task of the overall project including HHS, was supported by different key and non-key staff to oversee specific parts of it. With specific reference to the HHS, ACT staff, having specific knowledge and experience in similar activities, worked under her supervision in all HHS-related work phases.

The **HHS Field Manager's** duty was to coordinate the HHS team, especially those involved in on-field activities. In full coordination with the Team Leader, the HHS Field Manager prepared the detailed Operative Plan. The HHS Field Manager was responsible for transferring and explaining all contents of the finalized Operative Plan to all relevant staff members, ensuring that they acted in accordance with it. Additionally, the HHS Field Manager supervised all activities carried out by Supervisors, CAPI Assistant, Database Specialists, Quality Control and Revision Specialists and Coding Specialists.

Statistician/Sampling Specialist's duty was to adopt the proposed sampling strategy in defining the number of interviews to be conducted in each microzone, to verify collected data on a bi-weekly basis to guarantee their alignment with pre-defined target and represented the different strata of the population and to eventually define measures to fix possible unbalances. The Statistician/sampling Specialist was always coordinating with the HHS Team Leader and the HHS Field Manager.

6 Supervisors were coordinating sub-groups of enumerators, verifying daily completion of on-field activities, timely replacement of enumerators not anymore available because of unexpected events/situation (health, personal reasons, etc.) and informing encounters on possible mitigation measures to implement, based (also) on the direction given by the Statistician/Sampling Specialist. Supervisors were always fully coordinated with the HHS Field Manager and with the Statistician/sampling Specialist.

Enumerators were responsible for conducting interviews. Any enumerator was always fully coordinated with the assigned Supervisor.

CAPi Assistant was supporting enumerators in case of technical problems occurring during on-field activities. The CAPi Assistant was always fully coordinated with the HHS Field Manager and the Supervisors.

Database Specialists were responsible for the preparation of a well-structured database in which all data collected on-field was made available for further data analysis and elaborations.

Quality Control and Revision Specialists' duty was to validate the database of collected data by verifying their completeness and fixing any possible gaps/errors. Concerning possible correction of errors, it is worth saying that this concerned only and exclusively a limited set of information that could be objectively modified (for example, the correct spelling of a street name or a location). Quality Control and Revision Specialists were always fully coordinated with the Team Leader and the HHS Field Manager.

Coding Specialists were responsible for running data coding (the questionnaire was structured to collect information that could be directly coded) and finalizing it if any error could be observed. Coding Specialists were always fully coordinated with the Team Leader and the HHS Field Manager.

Overall data collection management was implemented by the Field Manager under direct supervision of the HHS Team Leader. Each staff member was promptly informed on his/her designated contact person, following the hierarchical structure of the working group down to the Team Leader, if necessary. Each member of the working group, according to his/her assigned role and responsibilities, was able to make any decision necessary to remedy any critical issue (if so), being understood that this decision must be transferred to all members of the working group so that they would take note of it and adjust their activities accordingly.

Before starting fieldwork, the Consortium recruited enumerators for the survey implementation. The most experienced enumerators participating in large-scale projects were selected and invited to the training. All enumerators were fluent in Georgian, and all trainings were conducted in Georgian. During the pilot activities the need of Russian-speaking interviewers raised, thus ACT translated the questionnaire in Russian and invited Russian speakers to the training as well.

The criteria for recruiting enumerators were:

- At least 2 years' experience of working as an enumerator.
- Experience of participating in large-scale projects (experience of involvement in projects related to transport was considered as an advantage).
- Familiarity with CAPi software, its navigation and functionality.

For fulfilling the task, about **80 enumerators** were selected and trained in total. At the initial stage, 56 enumerators were involved in the fieldwork, while 5 extra enumerators were secured as a back-up team to ensure smooth and uninterrupted implementation of the fieldwork processes. Because of unforeseen circumstances – such as the suspension of fieldwork for about two months – there was

a rotation of interviewers who could not return to the field after the resumption of works. About 20 new enumerators, who were trained in advance, joined the team after fieldwork resumption.

In total, 54 enumerators from Tbilisi group, 15 from Mtskheta group and 11 from Rustavi group were involved in the survey implementation.

3.3 PRE-PILOT AND PILOT SURVEYS

The pilot stage was divided into two parts:

- i. **pre-pilot**, conducted prior to the start of fieldwork, this phase aimed to test and refine the questionnaire.
- ii. **pilot**, focused on collecting information about the general context and readiness for cooperation. This served as the preliminary stage of the fieldwork, after which the final instructions were distributed.

3.3.1 PRE-PILOT SURVEY

A **pre-pilot survey** was conducted before starting the HHS to test the structure of the questionnaire, its contents and comprehensibility for respondents.

Pre-pilot survey was conducted from 29th to 30th October, involving 36 respondents (17 males, 19 females) aged 14 to 65, from different-sized households. Five different microzones were preliminary selected in Tbilisi (central and peripheral areas), namely Rustavi and Mtskheta.

Before the pre-pilot survey a **specific training session** for enumerators was held.

Five enumerators with experience and skills in conducting cognitive interviews were recruited for the pre-pilot study. During the training session, enumerators were informed about any question included in the questionnaire and the best approach to the potential respondents.

In this preparation phase, an electronic version of questionnaire was prepared in a CAPI system. Indeed, during the pre-pilot interviews both the contents and the technical features of the digitalized questionnaire were tested. The CAPI script was initially tested by the internal staff of ACT to make sure that coding of the questionnaire was done properly and that any logic and/or skip patterns were addressed correctly. Testing of the software would enable us to identify and correct all technical inaccuracies related to the programming of the software and make it more user-friendly and applicable.

ACT ensured the major skip logics to be built into the online/digital version of questionnaire to avoid or minimize mistakes and inconsistencies during the interviews. Special staff member – CAPI Technical Assistance - was assigned for this task and for the technical support of the process.

Overall, pre-pilot interviews were used to identify necessary modifications or refinement in the questionnaire and possible improvements of the technological devices (on-board structure of the questionnaire, usability, logics, etc.).

More specifically, pre-pilot survey helped in answering the following questions:

- Does every respondent understand the questions equally well?
- Are there hard-to-understand questions in the questionnaire (is any phrase or term vague for respondents)?
- Are questions mutually exclusive?
- Are all possible answers to the questions provided?

- Are the questions technically accurate?
- Are skips accurately suggested?
- Are instructions clear and sufficient?
- Is there any tendency when and why the respondents find it difficult to answer the questions and are willing to terminate?

During the pilot survey a *visit tracking sheet* was also used to collect feedback. Using the tracking sheet helped in understanding whether the sheet included all possible reasons of non-response.

After completion of the pre-pilot survey, the HHS Team Leader and the Field Manager conducted a debriefing session to discuss difficulties encountered or challenges of fieldwork and to define possible modifications or refinements to the questionnaire.

All enumerators participating in the pre-pilot survey attended the debriefing session. The enumerators were asked to talk about their general impressions or problems encountered during the data collection process and to provide recommendations. All technical or logical inaccuracies as well as any problem that occurred in the interviewing process were reported and analyzed.

Overall, the process proceeded smoothly without any significant hindrances. However, the main challenges were related to the length of the questionnaire and a few cases where respondents did not fully understand certain questions correctly or without additional instructions.

The other challenge the interviewers encountered was obtaining exact addresses, as some respondents were unsure of street numbers or even the names of the streets that were the starting points or destinations of their trips. Interviewers gathered the information as accurately as possible, and their experience helped the project manager to improve training materials for the final training sessions.

One more issue revealed during the pre-pilot survey was GPS mapping for the households interviewed. There were cases of missing GPS coordinates, which were manually input into the system. After the pre-pilot survey, it became clear that GSP coordinates can reflect the general microzone, as sometimes it can be inaccurate at the level of specific buildings.

After the debriefing session, the questionnaire was refined, and the finalized instrument was approved by the Client. Specifically, the following amendments were made to the questionnaire:

- The pilot survey revealed that there was no need to ask household-related questions to the household head only. The instructions were updated for interviewers to collect household-related questions from the most informed members of the family.
- D5 - the question regarding total household average monthly income was a bit irritating for the respondents, as it was at the very beginning of the questionnaire. After the pilot it was decided to replace the question after the household-related part, before personal sections start.
- P3 – the question related to the driving license types turned out to be confusing for the respondents. As a result of the pre-pilot, it was changed and made it easier to understand.
- P7 – the question investigating the top three factors influencing transport choice was initially unclear to respondents. They were first asked to choose the most important factors and then to rate each one as high, medium or low in importance. Since the factors had already been identified as the most important, this second step caused confusion. After the pre-pilot, the instructions were revised: respondents were instead asked to rank the three selected factors in order of importance.

- P8 – the question regarding safety while using public transportation was impossible to answer for some respondents, who had not been used public transport for a long time. To make the answer easier, the option “don’t know” was added with the instruction for interviewers not to read this answer.
- P8.1 – the probing question for P8 was re-formulated to make it clearer for respondents. Indeed, the question “In which part of the day did it usually happen?” was replaced with “Did you feel safe using public transport during different times of the day?” with more appropriate answers.
- P 10 – the question related to the type of payment used on transport lacked some option of response. After the pre-pilot survey, all payment types were included in the answers.
- P12 – the question related to disability or mobility impairment was followed with question P12.1, which asked respondents to describe the type of impairment. To ensure better alignment between P12 and P12.1, the phrase ‘*even if temporary*’ was added at the end of question P12.
- P13 – the question related to the trip on the previous day was key to the survey. The pilot revealed the need for a clearer explanation of what constitutes a “trip”. As a result, the detailed instructions were updated in both the training materials and the CAPI script. The main concern was on the definition of walking more than 500 meters.
- T section – the section of personal trips revealed that the respondents were inaccurate while recalling the trips route. After the pilot, it was decided to make the formulations easier for respondents and instructions more precise for interviewers, including more examples of possible different answers to better deal with ambiguous answers and gather more accurate information. In addition, the T8-T9 questions were decided to relate to any mode of transport, not only for motorized ones.

The final HHS questionnaire is presented in Annex 1.

3.3.2 PILOT SURVEY

After the training of survey staff and before the start of fieldwork, a **pilot study** was conducted with all interviewers who attended the training. The aim of the pilot study was to ensure that all interviewers fully understood the questionnaire and became proficient in completing it as well as to validate the operative plan and evaluate the real conditions faced by enumerators.

For each interviewer, sampling points were predetermined in different microzones, and each of them worked in the field sometimes with supervisors. During the pilot study, the work performed by each interviewer was reviewed, and additional instructions were disseminated. After the pilot study, fieldwork was suspended for an agreed period. During this time, the instructions were updated to ensure that interviewers were better equipped when they returned to the field.

573 interviews were conducted during the pilot survey and were added to the final database, after correcting errors.

3.4 TRAINING FOR ENUMERATORS AND SURVEY STAFF

All enumerators were invited to the training sessions at ACT head office. The first trainings were conducted in 4 sessions on 8th, 9th, 12th, and 13th November before the start of the fieldwork in November. Moreover, several sessions (both refreshing and the new ones) were conducted after resuming the work in February and March. The number of participants did not exceed 17-18 attendees per session to maximize participation and interactions. The trainings were attended by enumerators, Supervisors, Quality Control team, Data Revision Specialists, Coding Specialist, Database Manager and Field Manager.

The training for field personnel consisted of theoretical and practical parts concerning the following modules:

- Introduction to the overall project goals and objectives (led by the HHS Team Leader and the Field Manager);
- Internationally recognized ethical and safety recommendations (led by the HHS Team Leader and the Field Manager);
- Communication with respondents related to the survey's key messages, its purpose, and its importance for the community (led by communication specialist);
- Issues connected with recognition and communication with PWDs (led by the HHS Team Leader).
- Survey tools and related instructions (led by the HHS Team Leader and the Field Manager);
- Sampling strategy (led by the HHS Team Leader and the Field Manager);
- CAPI software / technical solutions (led by the database Manager and the Field Manager);
- Simulated interviews (led by the Field Manager and supervisors);
- Survey timeline and logistics (led by the Field Manager).

The Consortium compiled a comprehensive survey handbook for enumerators' reference during the data collection phase. The handbook included detailed instructions regarding the questionnaire (such as definition of main terms, type of questions and logical skips), sampling guidance, technical conduction of interviews in CAPI, etc.

After the introduction of the HHS Team Leader, who explained the goal and objectives of the survey, the training started.

A relevant part of the training session was dedicated to the detailed description of the survey questionnaire, explaining the rationale behind any question and informing the enumerators on the expected answers from interviewed people. It was fundamental for the enumerators to have a clear understanding of the questionnaire to facilitate respondents in understanding questions and provide them with any relevant information. During this phase, examples about possible misunderstandings from respondents or potential mistakes while collecting data were discussed. Overall, the enumerators were provided with question-by-question detailed instructions.

Upon completion of theoretical training, a practical exercise with simulated interviews was implemented. Simulated interviews considered role plays: all training participants were divided in groups of two people, one of which was acting as an enumerator and the other as a respondent. During the simulated interviews, roles changed to guarantee that all participants had the same exhaustive practical training. The process of simulative interviews ensured that each enumerator understood the challenges related to the survey and the questionnaire.

Simulated interviews played a very important role in preparing enumerators for the actual fieldwork. They helped identify ambiguous or confusing questions, provided insights on how respondents would interpret questions, helped to identify what topics resonate with them, and what were the best strategies of communication with irritated or not-interested respondents.

In this part of the training session, if needed, enumerators were observed, guided and supported by a supervisor and the Field Manager.

After completion of simulated interviews, uncertainties, difficulties or even mistakes observed during the survey were discussed in groups. After the discussion, a couple of additional instructions were formulated and distributed among field HHS team members.

The topics and training schedule are presented in the table below:

Table 3 - HHS Training Topics and Schedule

TIME	TOPIC	ACTIVITY
Introduction and Project's General Overview (2 hours)		
20 minutes	Opening	• Opening Remarks • Introduction of all attendees • Discussion of training schedule • Procedural issues
20 minutes	Goals and Objectives	• General information about the survey and implementing parties • Overview of the survey design, goals and objectives
20 minutes	Survey Ethics	• Consent form • Creating a safe environment and confidentiality issues
30 minutes	Communication with Respondents	• Key messages of the survey • The purpose and significance of the survey for the public
30 minutes	Communication with People with Disabilities	• Introduction, building trust, creating a safe environment • Explaining the purpose of the survey • Language used during the survey
Break – 30 minutes		
Survey Questionnaire (2.5 hours)		
2 hours	Content of the Survey Questionnaire	• Review of questions • Detailed instructions on completing each question • Questions & Answers
30 minutes	Respondent Identification and Selection Strategy /Fieldwork Logistics	• Respondent identification and selection strategy • Household visits tracking sheet • Coordination between field and office teams
Break – 30 minutes		
Simulative Interviews and Summarizing (2 hours)		
1 hour	Practical training	• Working in pairs in a role of interviewer and respondent
30 minutes	Update after Simulative Interviews	• Discussion of typical problems and mistakes during interviews and their solutions
30 minutes	Final Part	• CAPI - Technical support and solutions • Timetable for the fieldwork • Distribution of fieldwork documentation

Enumerators were duly trained in recognizing PWDs among households and dealing with them when submitting the questionnaire. This module covers:

- **Understanding disability** - enumerators received comprehensive training on different types of disabilities — physical, sensory, intellectual, and mental health. This session helped them to identify individuals who needed additional support during the survey process or the need to conduct proxy interviews.
- **Understanding the sensitivity of communication with PWDs** - emphasizes the importance of sensitivity and appropriate communication with PWDs. Special attention was given to the appropriate language for the interview and avoidance of assumptions regarding respondents' capabilities or needs.
- **Importance of building trust and best techniques of communication** – enumerators were taught to establish a trusting environment where PWDs could feel comfortable and safe while sharing their experience. The interviewers were provided with strategies for how to engage with individuals who may have difficulty hearing, speaking, or understanding. This could involve using clear language, visual aids or support from other household members.

Enumerators were provided with all materials needed for the fieldwork, such as:

- Enumerators' handbook.
- Copies of printed questionnaires.
- Sampling guidelines.
- Personal tablet with all necessary features and software.

The enumerators' handbook, the so called "Samakhsovro", contained specific information for the interviewers with definitions related to proxy interviews, sexual harassment, social card for transport, trip, personal trip description, and specific examples of trips and the correct ways to fix addresses:

- Street name and number – in an ideal case.
- Street name and approximate address or the nearest landmark to the address (metro station, mall, concert hall, etc.) – in less ideal case.
- The crossing/nearby street or any identified object across – in the worst case.
- Name and surname of the "street" – for example, not Chavchavadze but Aleksandre Chavchavadze Street or Ilia Chavchavadze Avenue.
- Avoiding vague or ambiguous descriptions, such as: Pharmacy (without specification), public school (without number), shop in front of home, etc.
- Addresses outside Tbilisi, starting with the city or village name.

Only enumerators familiar with CAPI software, its navigation and functionality, were invited to the training, and simulative interviews were done using CAPI in order to increase familiarity and proficiency with the tool. The fieldwork manager ensured a reference contact for any possible technical issues during interviews.

Training materials and documents were submitted to the Client for review and approval. Based on comments and suggestions from the Client, the final version of any material/document used during training sessions was prepared.

3.5 COMMUNICATION CAMPAIGN

To inform the public about the HHS, the team implemented a communication campaign in coordination with the Client. The primary objective was to raise awareness and encourage broad participation, ensuring a representative sample while fostering public trust through transparent and accessible communication.

Adopting a conative approach — designed to motivate action — the plan centered on clear, compelling messages, including:

- "Safe, Convenient, and Sustainable Transport Begins With Your Input!" (linking participation to improved mobility and quality of life),
- "Your Experience, Our Solution: Let's Improve Tbilisi's Transport Together!" (emphasizing shared responsibility and collaboration), and
- "Your Input = Better Transport for All" (highlighting the impact of each resident's contribution).

These messages were disseminated through a multi-channel strategy, which included a dedicated HHS project website ([HHS](#)), outdoor media, social media platforms, and — critically — trained enumerators who served as direct and trusted communicators with the public.

The overall tone of communication was supportive, caring, and responsive, ensuring that citizens felt heard, valued, and motivated to actively participate in shaping the future of Tbilisi's transport system.

However, following the suspension of fieldwork, social media activity has been deliberately limited in response to the civil protest. Nonetheless, the project website remains active, featuring an accessible layout designed to accommodate users with disabilities. Despite these constraints, public engagement has been positive, with over **100,000 individuals** reached through advertisements and approximately **3,000 visitors accessing the website**.

3.6 DATA COLLECTION

Prior to the fieldwork, the HHS Team Leader and the Field Manager developed a detailed fieldwork implementation plan, including:

- Detailed schedule of field visits identifying:
 - Field locations (microzones)
 - Starting address for the field location
- Number of households to be interviewed by each interviewer
- Fieldwork timeline, and
- Quality control plan.

Fieldwork implementation plan was shared with the quality control team members to provide sufficient monitoring of the data collection process at all stages. It was also distributed to supervisors and other staff involved in fieldwork management.

Enumerators were provided with a logistical plan related to their area of responsibility.

The HHS fieldwork began on the 19 November 2024. As planned, the interviews were conducted from Tuesday to Saturday to gather information about personal trips on working days. Even after the decision to ask respondents about both the previous day and two days prior, interviewers were specifically instructed not to ask about Sunday travel when conducting interviews on Tuesdays.

To avoid inaccuracies in the collected data during the winter holiday period, as it could lead to changes in travel behaviors, fieldwork was planned to suspend from 28th December 2024 to 16th January 2025.

It was anticipated that the demonstrations, and the population census conducted by Geostat — running concurrently with the household survey — might hinder the progress of fieldwork. These factors did, in fact, affect the survey process: on one hand, the number of completed interviews fluctuated across different weeks; on the other hand, street protests in Tbilisi posed significant challenges to the fieldwork, which was suspended from 5th December to 27th December, and further from 15th January to 11th February.

Initially, the plan was to distribute microzones equally among interviewers. During the fieldwork conducted in November, each interviewer was assigned between 10 and 18 microzones. This variation was influenced by factors such as the location of the microzones, their population density, and distribution characteristics. However, after the unplanned suspension of fieldwork and the change of the operative plan, the distribution of microzones was adjusted. Due to interviewer rotation and revised logistics, the number of microzones assigned to each interviewer ultimately ranged from 5 to 22.

The distribution of interviews was similar on different working days. There were no peak days and less busy days in terms of distribution, but sometimes more complete interviews resulted to be conducted during weekends or some specific days. A continuous check was made to guarantee that the completed interviews were well-balanced between the different weekdays.

The survey was conducted throughout the day – from morning until late evening. The approach given allowed the survey to cover all target groups of the population based on their travel behavior, including those who were inaccessible during the time interval defined by the ToR (from 18h30). The proposed strategy enabled the study of travel patterns among individuals of different age groups, professions, and lifestyles. However, a significant portion of the visits took place from 18h30 onwards.

Despite the above-mentioned information, the preferred time for conducting HHS was after 18h30. That said, each household was contacted after 18h30 before being removed from the survey sample.

The following challenges were taken into consideration when developing this strategy:

- Some households' members, who were not available for the interview after 18:30 (due to evening shifts, night shifts, lectures in the evening, etc.), were reached before 18:30. This approach guaranteed the possibility to include this stratum of respondents in the sample.
- If the survey began at 18:30, it could extend into late hours (21:00-22:00), during which time school children and elderly people might be unavailable to participate in the survey, as they tend to go to bed earlier. By removing the daytime restriction, the likelihood of completing HHS increased, particularly for families whose members would not be available later in the evening. Also, the winter timing of the survey was taken into consideration, as some respondents tend to retire earlier during this season.
- Respectively, the elderly, school children, unemployed, people with disabilities, housewives, etc. were easily reached during the early hours of the day, while those employed and unavailable during early time slots, were contacted after 18:30.

Removal of the daytime restrictions was also balanced by completing callbacks in the households and additional phone interviews with unreachable and unavailable ones during the physical visits. Phone calls were pre-agreed with individual members based on their preferences and availability for

the call. In exceptional cases, telephone interviews were conducted as sometimes it was more efficient than revisiting the household.

Using mixed-mode techniques enabled the team to cover a wide variety of groups in terms of gender, age, lifestyle, and disability.

Collecting survey data with CAPI drastically speeded up the data collection process and made it more convenient for all. Moreover, CAPI was efficient in terms of both time and quality, as it allowed to:

- Minimize the errors caused by human factors, such as wrong skips, mechanical errors, etc.
- Provide the opportunity to permanently receive and control information in real time - about the location of each enumerator, the progress of the interview and the process of carrying out field work in general.
- Provide the opportunity for enumerators to check the performed work, to terminate interviews (because of respondent's reasons), and continue after a while, to check the distribution of interviews, etc.
- Eliminate the need for data entry - a time-consuming process accompanied by mistakes as well.

Data collection was completed on 3rd May 2025. In total, interviews were conducted in **10.023 households with 18.389 respondents**. The distribution of households and interviews in different microzones is presented in Annex 2.

Challenges in microzones, resulting from the absence of detailed information on their exact urban and population characteristics, led to varying numbers of inquired households across different microzones — ranging from 1 to 55 (range of inquired respondents per microzone – from 1 to 98).⁸ Moreover, depending on the size and population density of the microzones, the sampling interval (initially set at 5 in urban areas and 3 in rural areas) was sometimes reduced to maximize the number of completed household interviews.

During fieldwork implementation, regular database checks were carried out to identify common issues and errors, allowing timely feedback and instructions to be provided to field teams. At the end of each working day, completed interviews were aggregated, and it was ensured that all data was uploaded, even when some interviews were conducted offline.

Throughout the whole fieldwork implementation process, progress reports of the completed works, including the number of completed interviews, revealed errors and their mitigation measures, possible changes in the fieldwork plan and timeline, were submitted weekly to the HHS Team Leader.

3.7 CALL BACK PROCEDURE

To ensure the participation of all targeted respondents, call back procedure was applied.

The specific procedure for callback (up to 6 times) was intended to be adopted for members of households who were not available when all other members of the family were interviewed. This technique was employed to improve response rates and gather data from individuals who may have been unavailable or missed during the first contact attempt. The callback procedure was particularly

⁸ The fluctuation in interview numbers across microzones is not only due to the redistribution of interviews but also because of the initial misidentification of GPS coordinates, which were later corrected and reassigned to the appropriate zones.

important for this survey, as high response rates are crucial for the accuracy and reliability of data at the microzone level. This helped to minimize bias and improve the representativeness of the survey results by reaching out to a broader and more diverse group of respondents.

Initially, enumerators tried to contact potential respondents during the first visit by ringing the doorbell of randomly selected HHs. Since this very first visit, the encounter tried to conduct face-to-face interviews with all members of the selected HH who were available and agreed to participate.

- If the household was unavailable for the interview, the interviewer made two additional attempts to contact it. The attempts were made both in the evening and during the daytime. If the household was still unavailable (closed, nobody at home, etc.), it was marked as “failed” and the interviewer moved to the next household. In some cases, the information regarding household status was obtained from the neighbors (for example, in the case where the house was permanently empty).
- During the first visit to the house, the interviewer tried to inquire as many respondents 14+ as possible. In case the respondent in the household refused to participate, it was reflected in the questionnaire. If there were other unavailable family members (such as not at home, at home but busy, ill, etc.), the enumerator made follow-ups by visiting the same HH in person. The follow-ups were scheduled, respectively.
- Respondents were visited at their scheduled interview time, which was arranged based on their availability to encourage participation.
- In cases where respondents were unavailable at the scheduled time, a new time for the interview was agreed. In case of need, the respondent could be visited up to six times.
- In rare cases, when potential respondents were too busy to do the interview in person or regularly return home late at night, a telephone interview was offered.

The enumerators kept track of who had been or not had been contacted, ensuring that follow-up attempts were made systematically and that all potential respondents were given the opportunity to participate according to their schedule. The attempts were made on different days and times.

If a selected respondent declined to participate or remained unreachable after all follow-up attempts, the interview was marked as “failed” or “non-completed”, with the corresponding reason documented. The proposed number of attempts was considered the most reasonable as the effectiveness of additional visits/attempts decreases after this threshold. Indeed, while initial follow-ups are likely to improve response rates significantly, additional visits might yield smaller response rates. Moreover, more callbacks than those proposed can be considered overly persistent or intrusive, potentially damaging to the reputation of the caller.

During fieldwork, the response rate at the household level varied widely. The most frequently cited reason was the household's refusal to participate in the survey. The second most common reason, a locked house, was reported significantly less often. Other cited reasons were minimal. The ranges of response rates are presented in the table below⁹:

⁹ The data presented in the table is not entirely accurate; verification of the GPS coordinates revealed that some interviews were conducted in different zones than initially recorded. Nevertheless, the data still reflects the general trend.

Table 4 – Response Rates on Household Level

Response Rate Range	Proportion of Microzones with presented response rate range
4%-20%	4%
21%-40%	55%
41%-60%	32%
61%+	9%

As shown in Table 4 – Response Rates on Household Level, in 4% of the microzones the response rate was below 20%, which required identifying and contacting a greater number of households to reach the target number of completed interviews. In most areas, 55% of the microzones, the response rate ranged between 21% and 40%. Notably, resident participation in the survey was strong: in one out of three microzones, the response rate exceeded 41%, and in one out of ten it even surpassed 60%. However, it should also be noted that the high response rate was likely influenced by the fact that in zones where it was not possible to conduct the planned number of interviews with households, those interviews were reallocated to zones where a higher response rate was expected.

3.8 DATA QUALITY CONTROL

Throughout the whole fieldwork, quality control procedures were applied to monitor the on-field activities and the results obtained, to get appropriate feedback for all team members and to have the possibility to continuously refine and improve the overall process.

Fieldwork quality control involved two main components: CAPI based quality control and repeated interviews:

CAPI based quality control provided the following evidence on the fieldwork implementation process:

- GPS mapping of the interviews coupled with the field visits
- Average duration of each interview
- Timeline mapping

During **CAPI based quality control** the quality control team received the geographical coordinates (latitude and longitude) of the conducted interviews from the database and performed the control by transferring the geographical coordinates to Google maps: (1) verifying whether the interview was conducted in the sampled area of the study and in accordance with the pre-defined sampling point; (2) observed whether the enumerator was moving in compliance with the prescribed rule.

ACT made every effort to minimize errors related to GPS coordinates collection – in particular, challenges related to device or software limitations (i.e. older or low-quality GPS receivers, bugs in the software or incorrect settings on the device, etc.). However, it could not prevent any challenges of GPS data capturing, such as:

- Physical barriers like tall buildings, mountains, etc.
- Weather conditions (heavy rain, snow, solar activity);
- Radio frequency interference from other devices or signals;
- Satellites positioned too closely together in the sky;
- Signals reflecting off buildings or other surfaces before reaching the receiver;

- Other.

The GPS coordinates of 100 percent of the households inquired were checked. There were 2 types of errors: absence of GPS coordinates or GPS coordinates fixed in a different area. In both cases proper GPS coordinates were identified and incorporated into the system both manually and with some additional technical assistance.

GPS mapping and control of GPS coordinates enabled accurate positioning of household addresses, which was essential for precise surveying and collection of quick data over large areas, significantly reducing the time required. Inaccurate GPS coordinates were adjusted so that all interviewed households were in the proper microzone.

Two to three days after completion of interviews on the field, **repeated interviews** were conducted with randomly selected respondents, using specifically designed quality control forms (mini questionnaires). Repeated interviews provided useful information about the HHS conducted - both an indication of the level of accuracy of the data collected and additional information on problems or challenges encountered during the on-field activities. This included checking whether the interviewer was on-site, whether the data on the household composition was recorded accurately, and whether the data on members aged 14+ was correctly noted. Additionally, because the survey questionnaire primarily focused on the previous day's experiences, which respondents may not clearly remember when re-checking the information, control questions were selected based on their more static nature, namely the employment question (P4) and the question about the payment method for public transportation fares (P10).

In this specific control phase, HHS interviews completed by different enumerators were checked: random respondents, inquired by all enumerators, were selected from the database and contacted by the quality team members to verify the quality of the interviews completed and to assess the proper approach adopted by the on-field staff members.

Overall, up to 30% of completed interviews were checked via repeated interviews. Accordingly, about 30% of interviews conducted by each interviewer were checked, and additional instructions and guidance were provided (if needed).

Furthermore, after completion of the fieldwork, all interviews were checked and revised and logical checks in terms of consistency were made.

In addition, all supervisors controlled the performance of their enumerator groups and systematically arranged debriefing sessions. Communication with enumerators, on the one hand, and among supervisors, the quality control team and the field manager, on the other, was continuous and highly effective.

Data quality control results were regularly shared with enumerators. Enumerators with abnormal ratios (such as too high numbers of surveys performed in a week, high number of refusals, results which have been verified as incorrect, etc.), were controlled more carefully.

After completion of each working week (Tuesday-Saturday), every Monday a summary table was produced to summarize the main indicators for each enumerator and sampling zone (such as, number of performed surveys, average mobility, number of households/respondents refusing to answer the questionnaire, etc.) in order to provide needed guidance for every next week, so that the on-field activities could be fully monitored, and atypical ratios detected.

Because the survey fieldwork was implemented using CAPI technology and the completed interviews were uploaded into the system, immediately, the quality control team performed the quality control process simultaneously, without pausing the fieldwork.

Based on the quality control results, the team permanently identified and addressed gaps in the fieldwork implementation process. Identified mistakes were corrected, if possible, by repeating field visits or re-contacting the respondents by phone. Quality control results were reported on a regular basis to the Field Manager, who was accountable to the HHS Team Leader.

On its turn, HHS Team Leader shared the following information with the Team Leader and Consortium:

Table 5- Quality Control Summary

Item	Specification
Number of conducted interviews	Performance for the previous week - Tuesday to Saturday and data calculated cumulatively, including the performance of all previous weeks.
Response Rates	The proportion of completed households to the target number
Demographic Breakdown	The distribution of responses based on key socio-demographic indicators, such as age, gender, the percentage of surveyed individuals with disabilities (including those with other mobility impairment, even if temporary), ratio of travels on previous day/two days prior, the average number of trips, the number of completed microzones.
Error Rates	Information on any errors encountered during data collection or processing.

The table typically presented aggregated data in a structured format, allowing for quick and easy analysis of key metrics and indicators to monitor the process and make amendments/distribute additional instructions, if necessary.

The table below presents a sample of the quality control results for one week.

Table 6- Quality Control Summary - Sample

Item	Specification
Number of conducted interviews	Number of inquired households in a week – 1493 Number of inquired households in total – 8261 Number of conducted interviews in a week – 2559/1.71 HS member, on average Number of conducted interviews in total – 14636/1.77 HS member, on average
Response Rates	44% (The reported percentage was not always verified on a weekly basis, as interviewers would start work in some zones but were unable to complete it within the same week).
Demographic Breakdown	Gender of respondents in a week - 65% female / 35% male Gender of respondents in total - 64% female/ 36% male Respondents with travel experience on a previous day, in a week- 60% Respondents with travel experience on a previous day, in total - 57% Average number of trips in a week - 2.15 Average number of trips in total - 2.17

	PWD number in a week - 9.8%		
	PWD number in total - 9.6%		
	Age groups:	In a week	In Total
	14-15	2,9%	3%
	16-17	3%	2.7%
	18-24	10.5%	9.9%
	25-35	16.9%	15,7%
	36-45	15.9	16.3%
	45-55	13.8%	13.9%
	56-65	17.1%	17,4%
	66	20%	21%
Error Rates	During several interviews in two zones, GPS coordinates were not recorded. This requires clarification. The interviewer went beyond the designated work zone. Additional interviews need to be planned in the appropriate zone.		

Overall, to guarantee the highest level of quality of fieldwork, ACT:

- Ensured data integrity through regular consistency checks.
- Ensured continuous feedback to fieldworkers by providing constructive advice, coaching, and mentoring, ensuring the adoption of best practices.
- Inspired fieldworkers to approach their tasks with honesty, diligence, and thoroughness.

In the event of discrepancies:

- Any enumerator or fieldworker found manipulating or fabricating data would be immediately dismissed (but it was not the case during the assignment).

3.9 ETHICAL CONSIDERATIONS

The current study was guided by internationally recognized ethical principles and considerations. Also, the Consortium was fully complied with the requirements set forth by the Law of Georgia on Personal Data Protection.

Besides, oral informed consent was obtained from all respondents before the interview started. Interviews were completed only with those respondents who provided consent to participate in the survey. Moreover, in the case of children and adolescents under 18, double consent was obtained from the actual respondent and from his/her parent and/or caregivers, allowing them to attend the interview, if desired.

Each respondent was thoroughly informed about their rights including the right to refuse participation or withdraw from the process at any point, even if the interview was already started, as well as the right not to share any personal information he/she was not willing to share by any reason.

Informed consent forms were presented to all survey participants, and they had the opportunity to ask all questions of interest regarding the survey's aim and objectives, use of the collected data, confidentiality issues, benefits and/or risks, etc. All procedures outlined in the informed consent form were thoroughly and strictly followed during the fieldwork.

4 HHS PROCESSING

This section presents information on how the collected data was processed and structured, and describes the data expansion/weighting procedure.

4.1 DATA CLEANING AND DATABASE STRUCTURE

The data collected during the HHS was acquired, checked and validated using automatic procedures that minimize the possibility of having incorrect information or any possible error using the tools used to conduct direct interviews. Although data cleaning procedure was applied for final phase verification.

In the database, nearly all variables were of numeric type. As for open-ended questions, upon the completion of the interviewing process, a special dataset for the manually entered open-ended questions was generated and shared with a coding specialist.

The final data was cleaned in the special statistical program SPSS 27.0, with the program SPSS syntax. Final dataset was subject to further control and congruence checks:

- Typos or inaccuracies in the manual entry of information;
- Inconsistencies within the data that could not be identified through the controls and logic embedded in the questionnaire;
- Information or aspects requiring further verification - for example, a trip duration that appeared unusually short or long given the departure and arrival micro-areas and the mode of transport used.

The cleaning process considered verification of the whole file, checking links between the variables, logic of the data, and validity of the database in general. In particular, the data cleaning process included:

- Check variable names and formats;
- Check variable types and formats;
- Check missing values (if any);
- Identify and check outliers;
- Check received data consistency;
- Check possible duplication of cases;
- Other.

During the whole process of data cleaning, the database manager was in permanent communication with the Field Manager and the Data Quality Control team. The field manager checked the received data with supervisors and provided additional instructions to interviewers while the data quality control team was conducting repeated interviews and re-checking data through repeated calls to the respondents (if necessary).

Final dataset was developed in SPSS format, including the following parameters:

- Variable Name – Title of the field which can be addressed at the cleaning, processing and analysis stages;
- Data Type – Each variable is associated with a specific data type. For example, a numeric variable accepts only numbers. A date-type variable is used exclusively for recording dates, and no other type of information should be entered. A text-type variable, such as “Respondent”, allows for the entry of any text-based information.

- **Data Length** – The length of the variable defines the number of entries, particularly the maximal number of symbols to be entered in the variable.
- **Variable Label** – The label of the variable is the definition of what the variable represents in essence. For example, the label of the variable “Sex” will be the “gender of the respondent”.
- **Value Label** – The value label gives the meaning of each of the values within a variable. For example, for the variable Gender: 1= female, 2 = male, etc.
- **File Names** – Each database has the SPSS extension of SAV. Once data are entered through data entry forms, they are automatically archived with the SAV extension.

The Database Manager was responsible for the accuracy of the overall database and worked in close cooperation with the HHS Team Leader.

Upon completion of the data collection, the cleaned dataset was produced and utilized for further analysis. Furthermore, in the cleaned version of the data, the coefficients to correlate sampled strata to the statistical universe of reference were calculated, using data on the total population of Tbilisi and nearby territories/municipalities. (see Chapter 4.2).

4.2 DATA WEIGHTING AND EXPANSION

The goal of data expansion for this survey was to improve the accuracy, representativeness, and utility of survey data, leading to more robust and actionable insights.

Within data expansion, two main strategies were utilized:

1. Data Weighting - the aim of the data weighting was to ensure the restoration of proportions of the population in the survey sample, adjusting survey data to reflect the population more accurately. As a result, if certain demographics were underrepresented in the survey sample, weighting corrected this imbalance to make the data more representative.

Therefore, to provide statistically robust generalizable data, after completion of fieldwork, data was weighted. The criteria used for data weighting included gender (male, female) and age groups. Since calculating population proportions by gender and age in the identified microzones was not feasible because of incomplete data, general demographic distributions from the following sources were applied to infer characteristics for the microzones, namely: : (1) Tbilisi population, including surrounding villages, which are administratively part of the capital; (2) Rustavi city; (3) Mtskheta municipality; and (4) Gardabani municipality.

Data from the 2014 Georgian Population Census, conducted by Geostat, was used for weighting. Two types of weighting coefficients were calculated:

1. **Household Weight** – used for general sections related to households.
2. **Individual Weight** – used for data related to each family member.

To calculate the **household weight** (weight_hh variable), the stratification criterion used was the macro-zone. The survey area was grouped into four categories: Tbilisi, Rustavi, Gardabani, and Mtskheta. As a result, four strata were defined. The weighting coefficient for each stratum was calculated by dividing the number of households living in the stratum by the number of surveyed households in that stratum. The formula for calculating the weighting coefficient is:

$$w_i = \frac{N_i}{n_i} - \text{where } i = 1 \dots 4$$

To calculate the **individual weight** (weight_ind variable), three stratification parameters were used:

1. **Geographic Parameter (Macrozone)** – same as with household weights: Tbilisi, Rustavi, Gardabani, and Mtskheta.
2. **Gender** of the household member.
3. **Age** of the household member, grouped as follows: 14–15, 16–17, 18–24, 25–35, 36–45, 46–55, 56–65, and 66 years or older.

Based on these stratification parameters, 64 strata were created. For each stratum, the weighting coefficient was calculated by dividing the number of people in the population belonging to that stratum by the number of surveyed respondents in the same stratum. The formula used is:

$$W_i = \frac{N_i}{n_i} - \text{where } i = 1 \dots 64$$

In addition to the main weights, **normalized weights** were also calculated. These represent proportionally reduced versions of the calculated weighting coefficients, scaled to match the number of respondents. At the microzone level, an average of **19 households** were surveyed per microzone, with a margin of error of **22.2%**. For microzones with fewer households - 15 as an example, the margin of error increased to **25.1%**. While for overrepresented zones – 30 households as an example, the margin of error dropped to **17.5%**.

Regarding individuals, an average of **32 individuals** were surveyed per zone, with a margin of error of **17.2%**. For zones with 25 and 50 individual interviews as an example, the margins of error were **19.5%** and **13.7%**, respectively.

The overall sampling error was 1.2% for households and 1.0% for individuals.

The data weighting process allowed for the adjustment of the collected data to better reflect the general population, compensating for segments that were underrepresented during the survey. For example, in the given study, 64% of respondents were women and 36% were men, while the natural population proportion is 55% women and 45% men, according to the 2014 census data by Geostat. The weighting procedure ensured the restoration of the correct proportions in the distribution.

As for the survey margin of error, it indicates the percentage by which the results obtained from the study may differ from the actual values. For example, a $\pm 1\%$ margin of error at the individual level means that if the survey shows that 62% of individuals had a travel experience in the city on the previous day, the actual value likely falls within the range of 61% to 63%. The margin of error, in turn, depends on the sample size. It is precisely the large sample size that ensures the margin of error in this study is minimal.

2. Checking received data - the aim of checking received data was to monitor the key characteristics – gender and age – and ensure more proportional distribution of subgroups in each of them. To improve socio-demographic characteristics, the call back procedure was actively applied and monitored.

Final dataset, including expansions, is annexed to this report (see Annex 3). The database contains separate datasets for household sections and for individual sections (HH members), as they have different weighting coefficients.

5 OUTCOMES, RESULTS AND DELIVERABLES

5.1 DATA ANALYSIS

The information collected during the survey campaign was processed using different methodologies, in line with the objectives defined during the design phase. The extensive dataset acquired served several key purposes, detailed as follows:

- **Analysis of Mobility Patterns and Travel Habits**

The collected data were analyzed to describe the mobility behaviors of Tbilisi's population and that of the surrounding study area. Particular attention was given to aspects, such as:

- Modal split of trips reported in the Household Survey (HHS).
- Multimodal travel behaviours.
- Key factors influencing transport mode choice.
- Average duration and length of reported trips.

These analyses were conducted with reference to the overall population surveyed, as well as to different user segments (by gender, age group, residential microzone, etc.), and at both the city-wide and local zone levels, depending on data significance.

- **Cross-Analyses with Infrastructures and Socio-Economic Context**

Additional analyses were performed by correlating mobility demand data with the available transport infrastructures and services. These were further enriched by integrating socio-economic, demographic, and urban data, allowing for a comprehensive understanding of travel behaviors.

- **Preparation of Technical Outputs and GIS Mapping**

A wide range of technical materials—including tables, charts, and GIS maps—were developed to support the interpretation of key mobility trends. GIS maps played a crucial role, enabling the integration and cross-analysis of mobility data with other datasets, such as socio-economic and demographic indicators and characteristics of the urban environment. These maps also supported the estimation of travel flows between each Origin-Destination (O/D) zone pair, disaggregated by purpose of trip and mode of transport.

- **Processing and Validation of O/D Matrices**

The data obtained through the O/D surveys were processed and structured in accordance with reference to population definitions. The resulting matrices were then validated through a combination of qualitative and quantitative approaches, incorporating available traffic counts and other mobility datasets to ensure consistency.

- **Estimation of Temporal Extrapolation Coefficients**

Where necessary, coefficients were estimated to extrapolate trip numbers across various time windows of the day beyond the modelled peak hour.

- **Data Coding for Enhanced Modelling Accuracy**

Particular attention was dedicated to the coding of collected data, especially about the georeferencing of trip origins and destinations to individual traffic zones. This was essential to link HHS results with census data and other external sources, facilitating robust modelling and analysis.

• Calibration and Validation of Mobility Demand Models

The HHS data supported the calibration of random utility models, designed to simulate travel behavior across both private and public transport systems in Tbilisi. These models were tailored to incorporate the most influential variables identified through analysis.

Furthermore, passenger boarding and alighting counts at subway stations and public transport stops—complemented by other existing datasets—were used to validate model outputs.

• Mobility Demand Estimation Through Utility-Based Models

The overall mobility demand for the urban area of Tbilisi was estimated to be using utility-based models calibrated specifically for the local context. These models adhered to methodological standards set by the US Bureau of Public Roads (BPR), whose sampling benchmarks were used as reference throughout the study. The possibility to directly estimate mobility patterns from survey data, ensuring high reliability of the results, was facilitated by the high sampling rate adopted for the HHS.

Table 7 - Sampling rates for household surveys as a function of resident population (BPR-USA)

Population	Recommended sampling rate	Minimum sampling rate
Less than 50.000	0.200	0.100
50.000 to 150.000	0.125	0.050
150.000 to 300.000	0.100	0.030
300.000 to 500.000	0.067	0.020
500.000 to 1.000.000	0.050	0.015
More than 1.000.000	0.040	0.010
Tbilisi (1.087.000 residents)	0.040	0.010

To estimate the origin-destination (O/D) matrices representing all trips made within the Tbilisi area, various modeling platforms were developed based on data collected from HHS. These platforms were specifically designed to replicate internal mobility, both in terms of entire journeys and the individual segments that compose them.

A detailed account of this part of the analysis will be provided in the documentation on Task 3.

5.2 SUMMARISING RESULTS

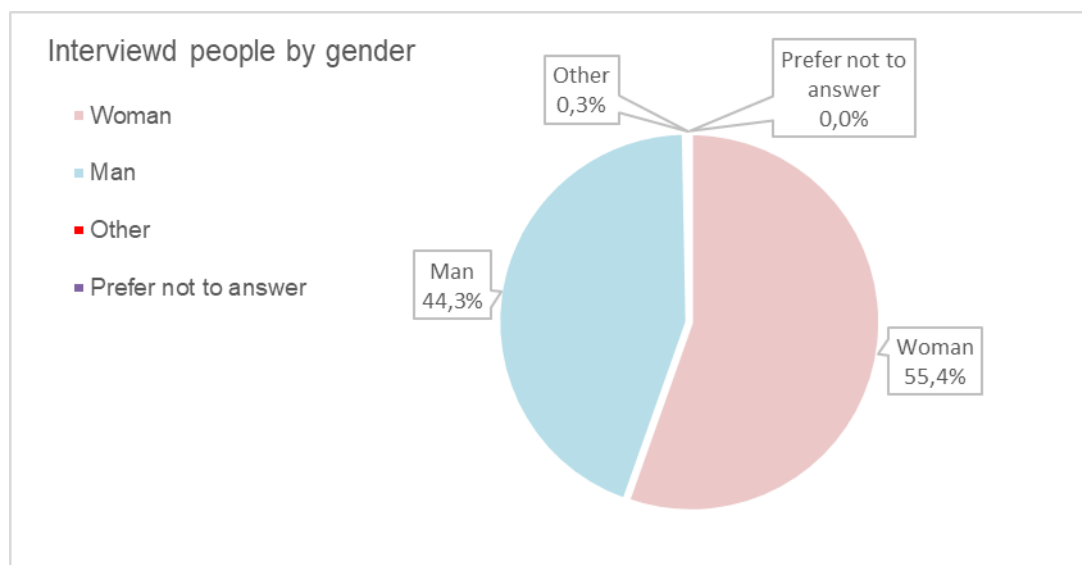
In Task 1, several data elaborations were carried out with a **dual objective**: to provide an immediate and accessible overview of the main findings emerging from the HHS, and to offer valuable insights for a more in-depth analysis of the observed phenomena. These elaborations were designed to deliver a comprehensive picture of the surveyed households, capturing not only mobility-related aspects but also the broader socio-economic and behavioral dimensions investigated through HHS. A first set of these elaborations is presented below, offering a preliminary interpretation of the collected data.

Particular attention was given to the preparation of tabular outputs and to the organization of results in a format that would support meaningful comparisons and interpretations. Additional elaborations, tables, graphs or maps could be made available upon Client's request.

First, we present a set of elaborations describing the actual sample reached through the completed HHS. While the gender distribution is slightly uneven, with 44% of respondents being men, this does not compromise the overall statistical representativeness of the sample, which remains well balanced. In fact, based on the latest data obtained from reliable sources, such as the 2024

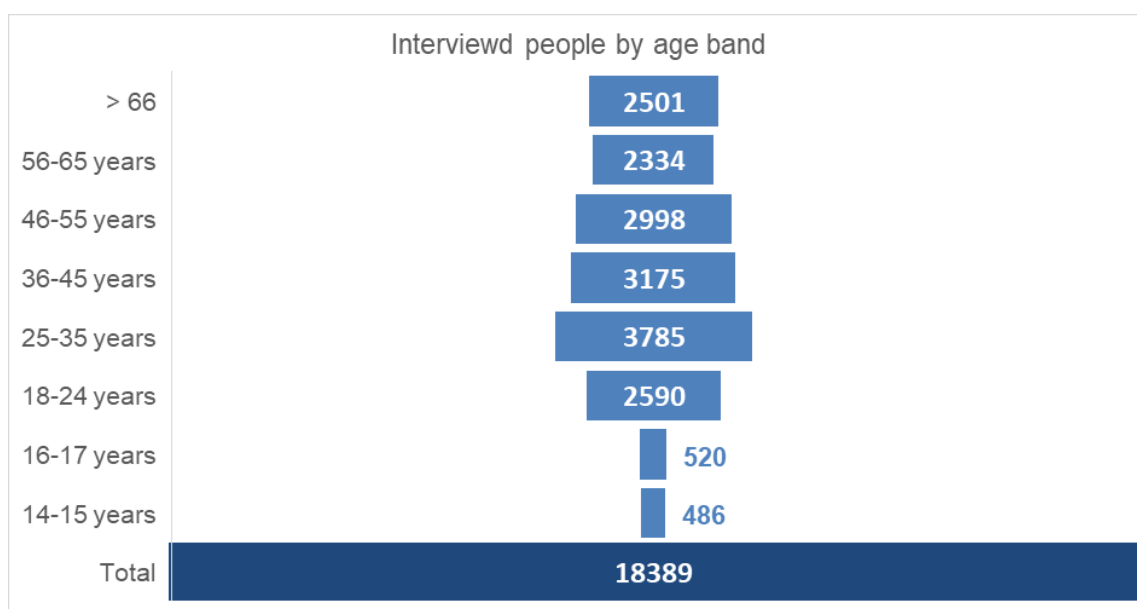
publication by the National Statistics Office of Georgia, the national population is composed of approximately 1,920,000 women (52.0%) and 1,774,000 men (48.0%) .

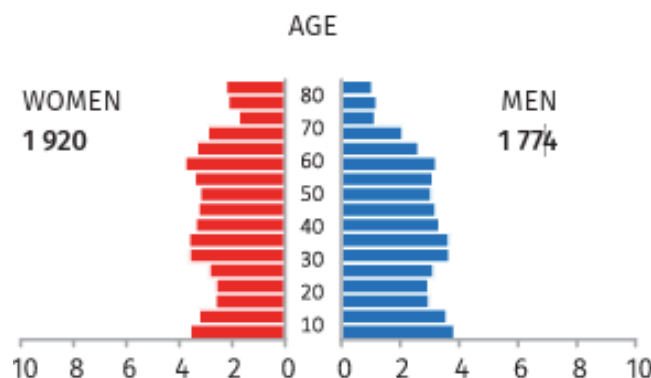
Figure 1 - HHS sample by gender



The **age distribution** of respondents is also well balanced, with a slightly larger share in those age groups that typically exhibit higher mobility rates. The only population segments with a smaller representation are teenagers—a reasonable outcome given their generally lower levels of mobility and the fact that they are not expected to use certain modes of transport, such as driving a private car.

Figure 2 - HHS sample by Age Group

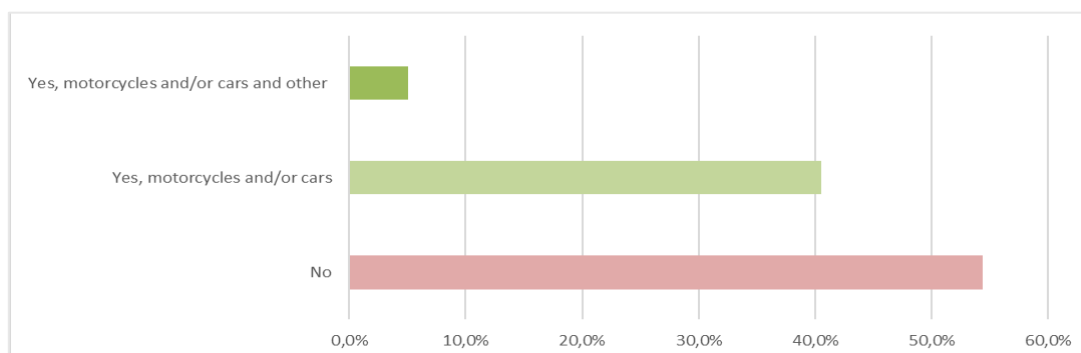




The age group distribution is once again similar to that of the national population presented in the 2024 publication by the National Statistics Office of Georgia.

Although the age distribution of the sample might suggest that nearly all respondents could hold a **driver's license**, the data collected through the HHS indicates otherwise: almost 55% of respondents reported they did not possess any type of driver's license. This figure, which is certainly significant in the context of mobility analysis and travel behavior in Tbilisi, clearly impacts both the number of trips made and, even more importantly, the predominant mode of transport used. A more detailed discussion of these aspects is provided below.

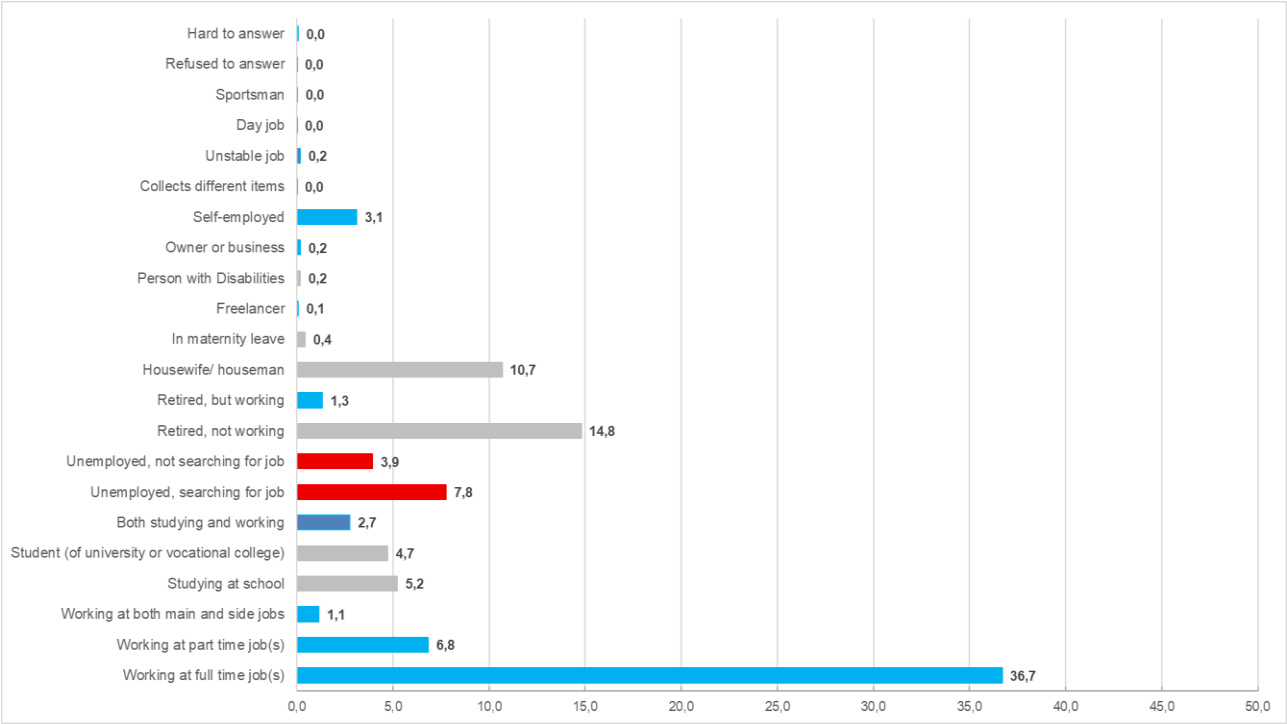
Figure 3 - Driving licenses



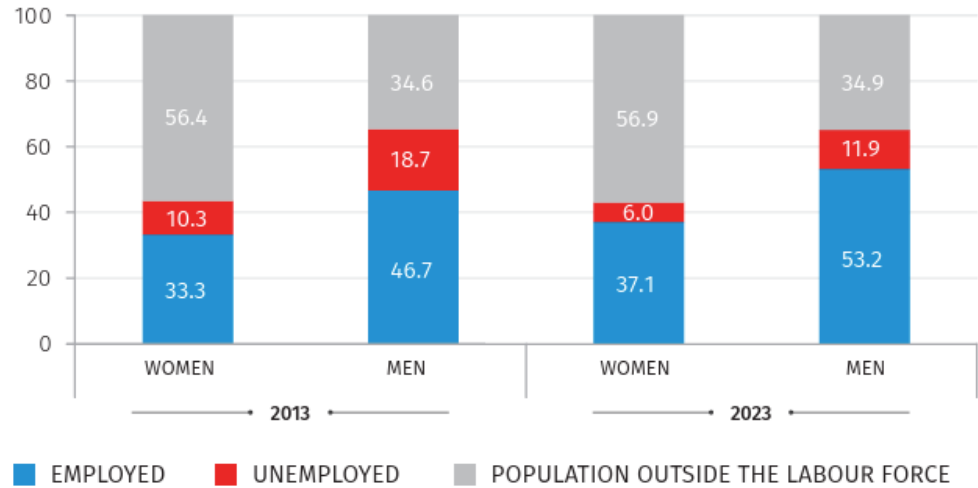
The data on respondents' **employment status** shows a distribution consistent with age groups, particularly for students, including working students, and retirees. However, no direct comparison can be made regarding the specific types of employment reported by workers, as there are no suitable external data sources available. Only the data on full-time and part-time workers can be meaningfully assessed: the share of full-time workers stands at 36.7%, which aligns well with the European average, while part-time workers account for approximately 7%, slightly lower than the European benchmark of 8%¹⁰.

¹⁰ Source: Trading Economics elaborating Eurostat data.

Figure 4 - Occupation of interviewed people



DISTRIBUTION OF POPULATION AGED 15 AND OLDER BY
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(%)



Overall, the employment levels recorded through the HHS are consistent with national data from 2024. According to these figures, 53.2% of men and 37.1% of women are employed.

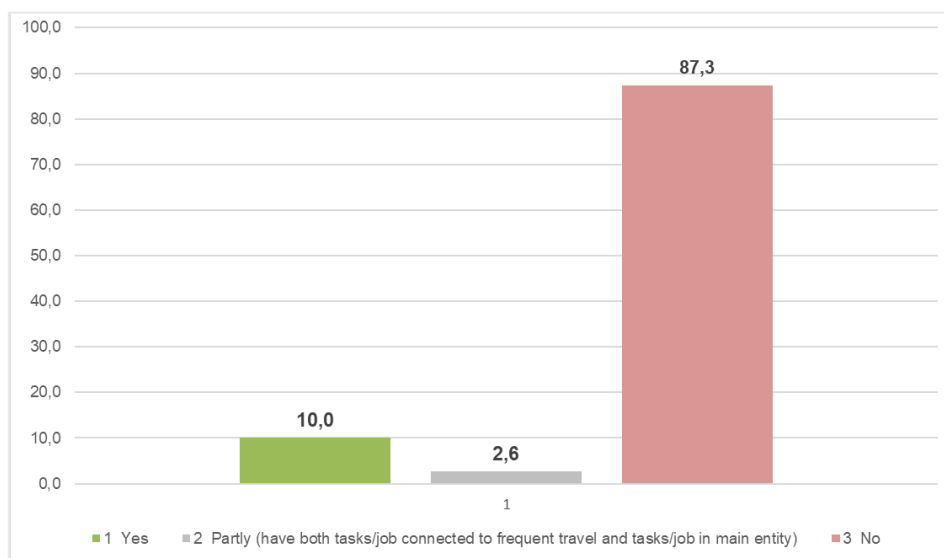
A more relevant piece of information regarding workers concerns those whose occupation involves **frequent daily travel**¹¹ within the city, such as taxi drivers, couriers, and similar professions. This is

¹¹ Frequent trips made across the city by specific categories of surveyed residents, such as taxi drivers or couriers

certainly an interesting finding, as 10% of respondents reported belonging to one of these specific categories and, accordingly, making a higher number of trips throughout the day.

While it is reasonable to assume that respondents in this group may have had some difficulty accurately reporting the exact number of trips made on the day they were asked to describe their typical travel behavior, their responses to the question on daily trip count can still be identified: values such as 10, 15, 20, and 30 show noticeable spikes in the distribution, as illustrated in the following.

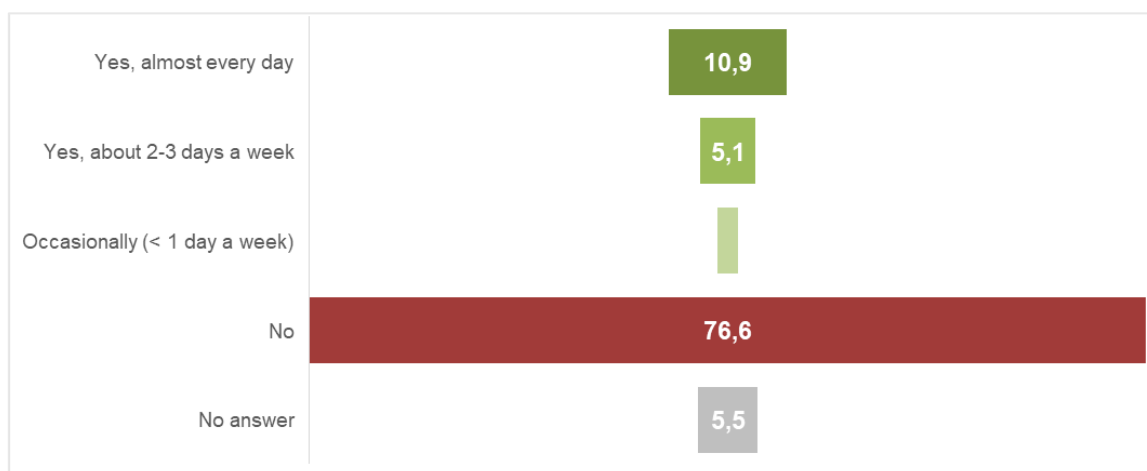
Figure 5 - Frequent travels related to work



The percentage of respondents who reported having made trips on the day they were asked to describe their typical travel behavior is fully consistent with the percentage of those who stated they had made frequent work-related trips on the same day.

Still in relation to the correlation between employment status and the number of trips made within the city, another interesting data collected through the survey concerns **remote work or remote studying**. The share of respondents who work remotely every day, namely 10.9%, and those who do it at least 2–3 times per week, 5.1%, undoubtedly contributes to a reduction in the average number of trips made by the surveyed population.

Figure 6 - Smart Workers



Within the scope of this project, and in support of the traffic model development and calibration, one particularly relevant aspect is the **modal choice process**. In particular, the survey investigated the factors influencing the choice of transport mode."

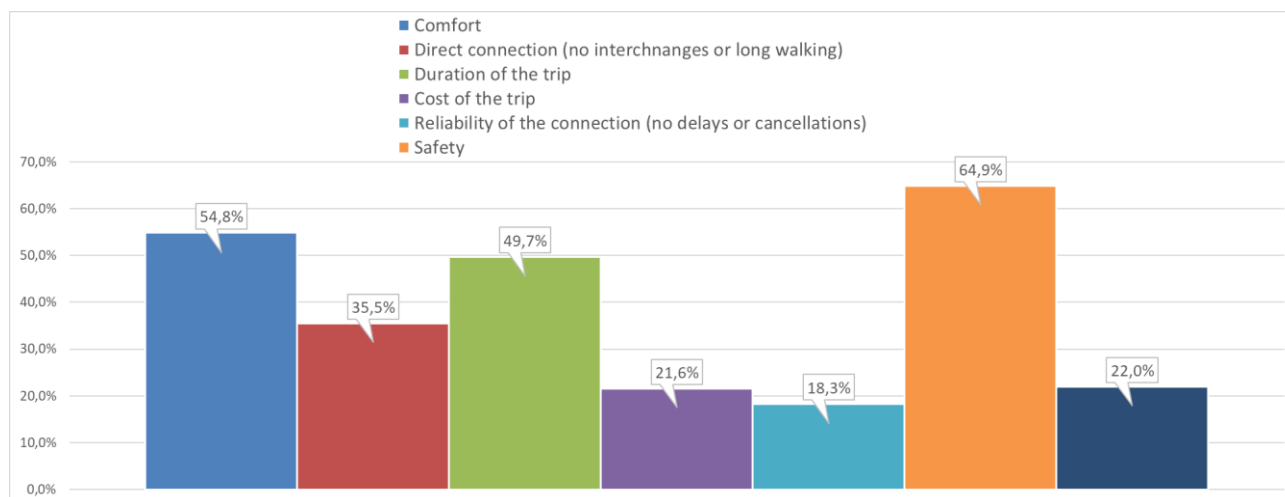
The first key finding relates to “*safety*”, which emerges as a determining factor for two out of three respondents. This should be considered alongside perceptions of safety on public transport: 6.3% of respondents reported feeling unsafe at all times of day, while 10.4% indicated feeling unsafe during certain time periods.

Equally relevant is the importance attributed to “*travel comfort*” (54,8%) which may be associated with the use of private vehicles—as is often the case in such surveys—but also with public transport services.

The third most influential factor is the “*travel time*”, selected by 49.7% of respondents. This aspect calls for a cross-analysis that includes both road network congestion levels and public transport travel times, based on dedicated surveys.

Interestingly, one factor that typically plays a major role—but appears to be less significant in this context—is “*travel cost*”, mentioned by only 21.6% of respondents. Similarly, low levels of importance were attributed to “*accessibility*” of transport modes or services (22%) and service “*reliability*” (18.6%). In contrast, a significantly higher share of respondents (35.5%) highlighted the importance of ease in making transfers without long walking distances.

Figure 7 - Mode choice: influencing factors



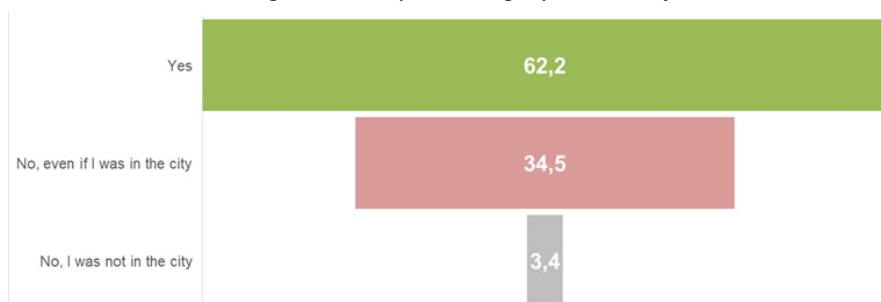
5.2.1 Travel habits

Looking more closely at the analysis of respondents’ travel habits, the first notably significant finding concerns the share of individuals who made **trips within the city** on the last weekday prior to the interview¹². The results reveal a slightly lower mobility rate (62.6%) compared to what is typically observed in other cities of similar size and population to Tbilisi, even compared to East European cities¹³.

¹² This is summarized in such terms, recognizing that there may have been slight variations across interviews, but in any case, the data refers to a typical weekday.

¹³ Source: Household Travel Surveys, UITP, OECD, ITF.

Figure 8 - People making trips in the city



This data is perfectly aligned with that derived from the 2016 HHS, in which the proportion of people who did not perform any trips was around 35%, with a significantly higher value among women than men. It is worth saying that in the 2025 HHS, the data could be slightly influenced (reduced) by the civil protests and demonstrations occurring during the data collection period.

This figure is certainly of interest, as it essentially reflects the mobility rate of individuals and, consequently, serves as an indicator of how much people travel, generating demand on the road network and/or public transportation systems—both of which are fundamental components in the development and calibration of a traffic model.

Table 8 - Residents making at least one trip on a typical day - Benchmark¹⁴

City/Area	% of residents making ≥1 trip per day
Tokyo	88-92%
London	85-90%
New York	82-87%
Paris	85-90%
Berlin	80-85%
Seoul	90%
Singapore	88-93%
Cities in Central Europe (Barcelona, Milan, etc.)	75-85%
Cities in East Europe (Bucharest, Sophia, etc.)	65-75%
TBILISI	62,2%

The average **number of daily trips made by individuals in Tbilisi** is lower than is typically observed in comparable cities (65%-75%). According to *The Geography of Transport Systems*, the average urban resident makes between 3 and 4 trips per day.

A quite important percentage of people, 61,7%, reported making **frequent work-related trips**¹⁵ on the day they referred to when describing their typical daily travel behavior during the interview. . However, despite this statement, the average number of work-related trips remains very low. As highlighted in the next elaboration, 51.7% of respondents in Tbilisi reported making only 2 trips per day. It is also important to note that some of the higher outliers observed in the data are likely attributable to individuals whose work involves a much higher number of trips throughout the day—such as taxi drivers, couriers, and similar professions. In these cases, it is entirely reasonable that

¹⁴ The presented data were collected from different sources and elaborated. Data refer to the period 2017-2024 excluding COVID

¹⁵ This refers to trips made by specific groups of workers, such as taxi drivers or couriers

responses regarding the number of daily trips were rounded to approximate values such as 10, 15, 20, or 30.

Figure 9 – Trips related to work

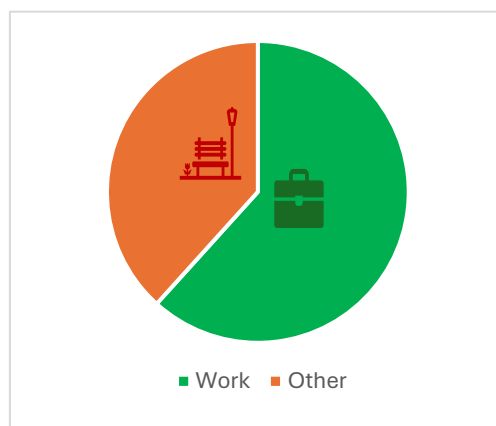
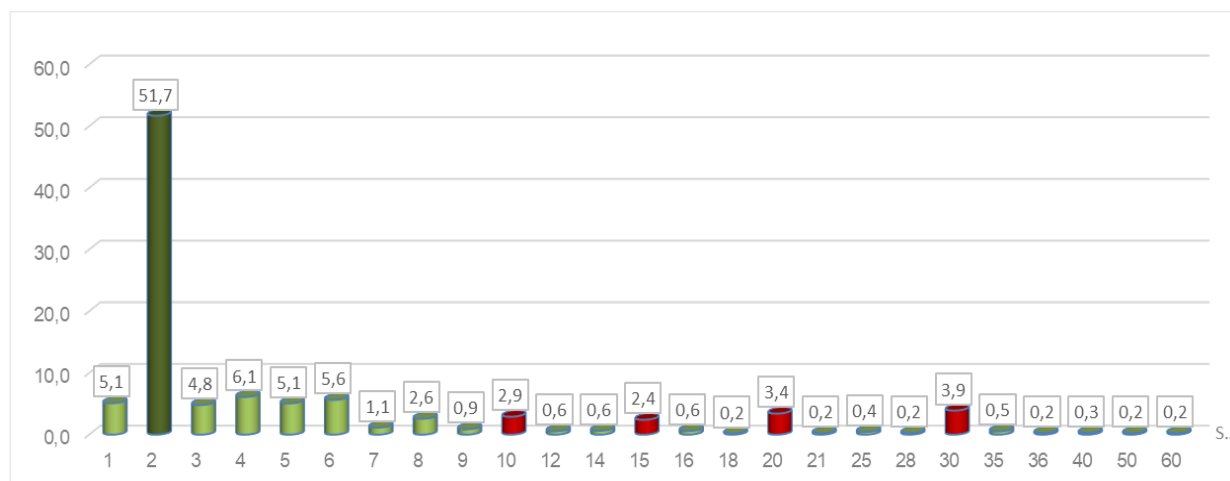


Figure 10 - Number of trips related to work



Still concerning the frequent trips related to work, an interesting finding from HHS concerns the use of different transportation modes. The results indicate a relatively modest modal share for private cars (44%)¹⁶, especially considering that the data refers specifically to modes of transport used for frequent, work-related trips. By contrast, the share reported for public transportation appears significant (38.5%). While trips made by motorcycle (2.8%) and on foot (around 1%) are of little relevance in this context, there remains a 13% share attributed to the 'Other' category. The meaning of this is somewhat difficult to interpret, given that the list of response options covered a wide range of transport alternatives. It is likely that this percentage partly reflects a reluctance on the part of some respondents to provide a precise answer to the question.

¹⁶ Because "taxi" was not an option, it is reasonable assuming that respondents as taxi drivers indicated "private car".

Figure 11 – Modes of transport for frequent work-related trips

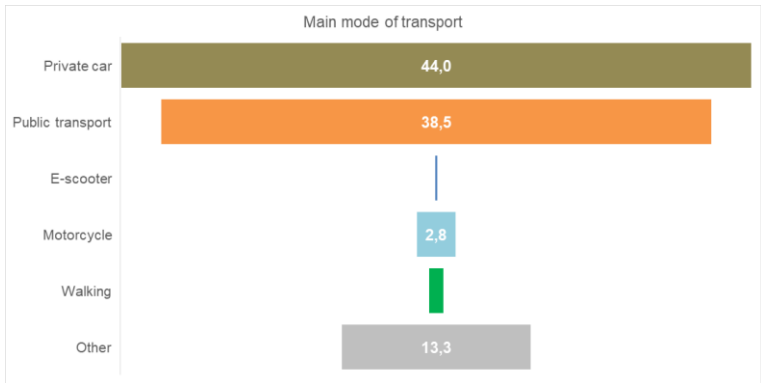
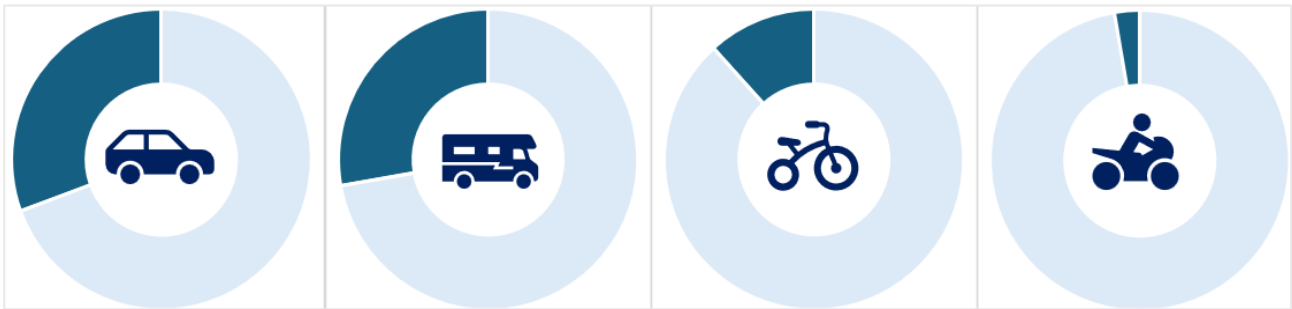


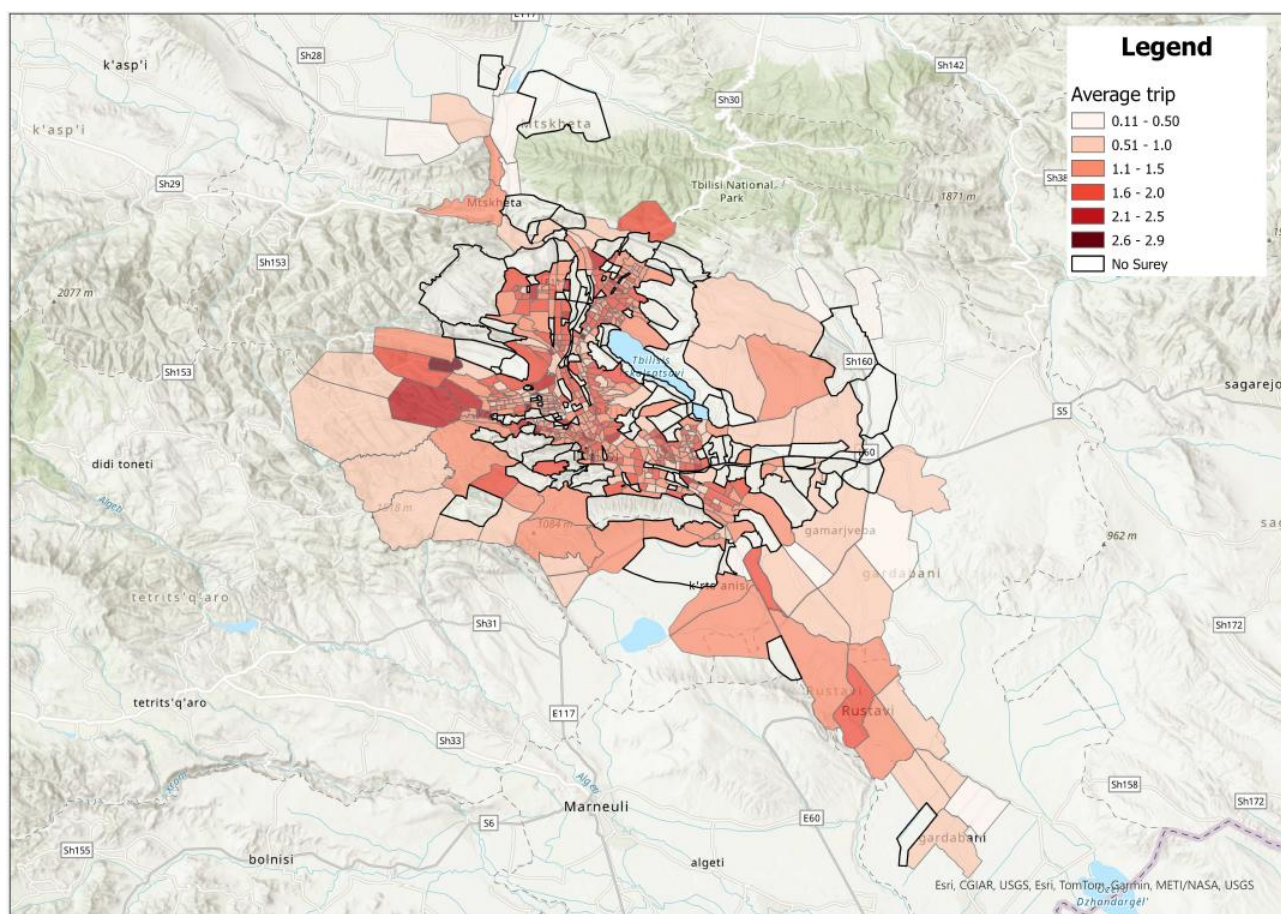
Figure 12 – Infographic on the most frequent modes of transport



The analysis of the average number of daily trips at the city level provides several noteworthy insights. First, it is observed that areas with the highest trip rates are typically those with elevated motorization levels. However, this does not necessarily imply that greater car availability directly results in more trips, especially considering that, as shown in Figure 13 - Average n° of trips per person per area, the car's modal share remains relatively limited.

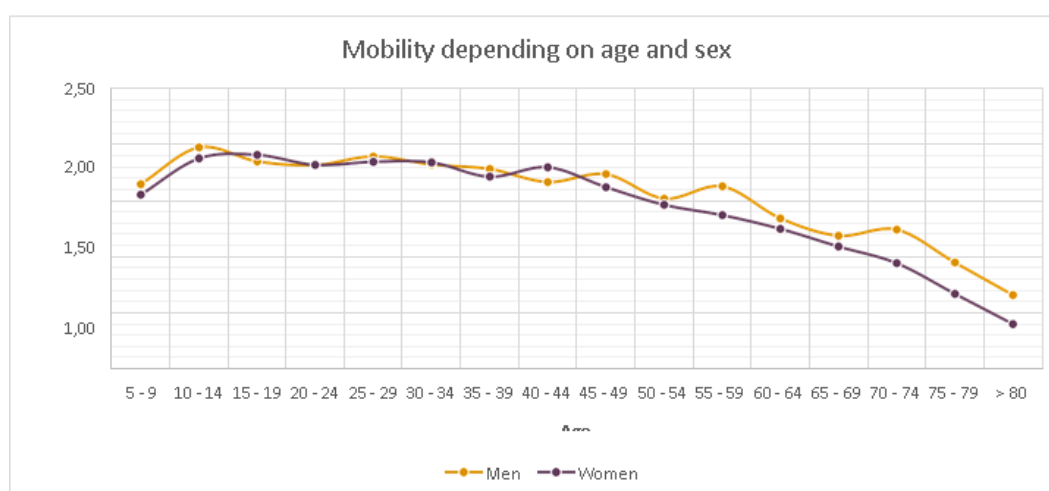
A second relevant observation concerns the more peripheral areas of the city. These zones are often primarily residential in nature and are generally expected to generate a significant number of commuter trips toward the more centrally located business and commercial districts. However, based on the results of the HHS, Tbilisi's peripheral zones display relatively low trip rates, often even below 1 trip per person.

Figure 13 - Average n° of trips per person per area



The average number of trips per day is comparable to that revealed by the 2015 HHS, if considering that in 2025 people under 14 were not interviewed. As highlighted in the next figure, the average number of trips for people under 50 is between 1,5 and 2, while that of people aged more than 50.

Figure 14 - Average n° of trips per person (by age and gender) in 2016

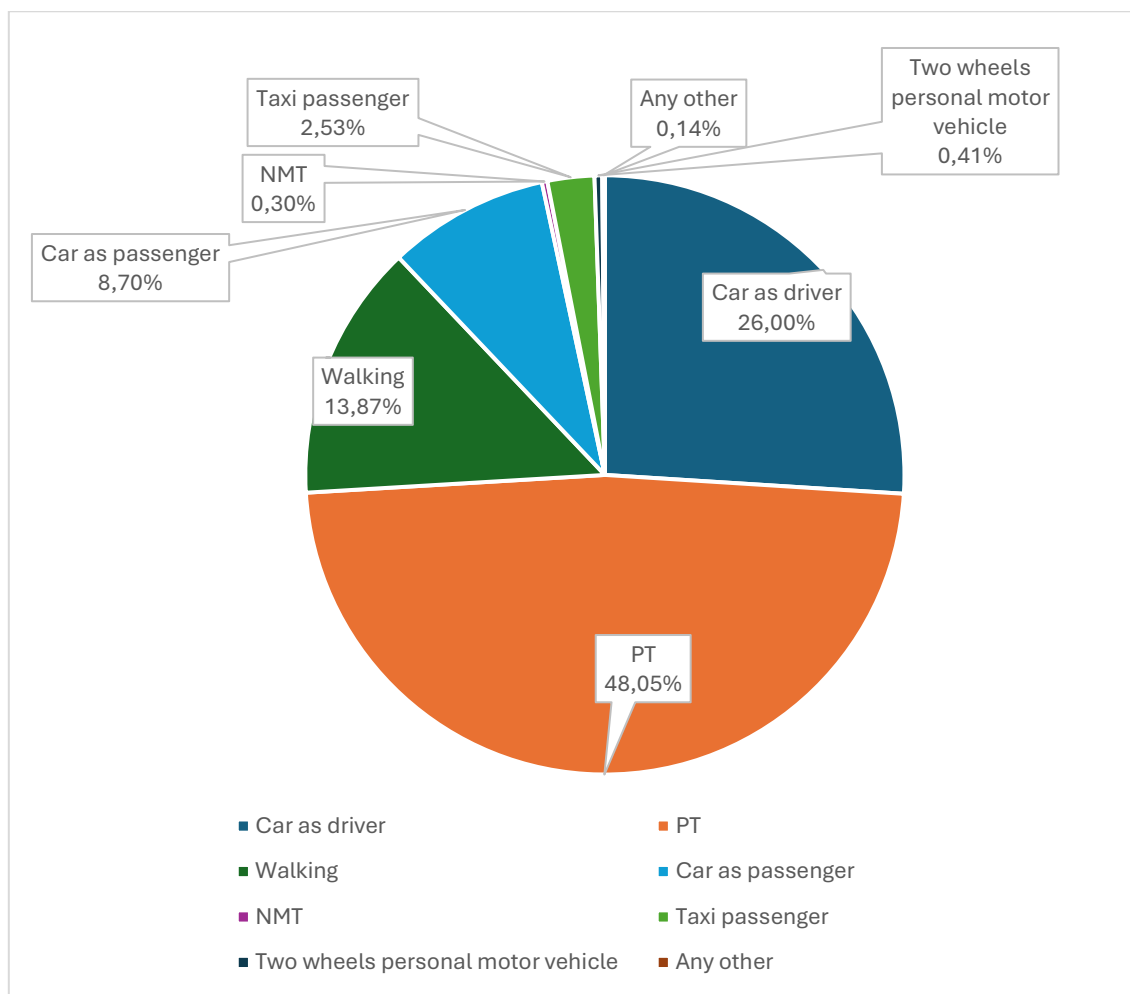


One of the most notable findings from the HHS concerns the use of **different transportation modes for urban travel**. The results show that private car usage, either as a driver (26%) or as a passenger (8.7%), represents a combined modal share of approximately 34.7%, suggesting a substantial but not dominant reliance on private vehicles. In contrast, public transport accounts for 48.05%, making it by far the most frequently used mode among respondents.

Walking constitutes 13.87% of the reported main modes, which is a significant share but may still underestimate actual walking activity, particularly for short-distance trips or walk segments that were not perceived as the primary mode. Similarly, taxi usage stands at 2.53%, while non-motorized transport and two-wheel personal motor vehicles account for 0.30% and 0.41% respectively, both very minor components of the overall modal mix.

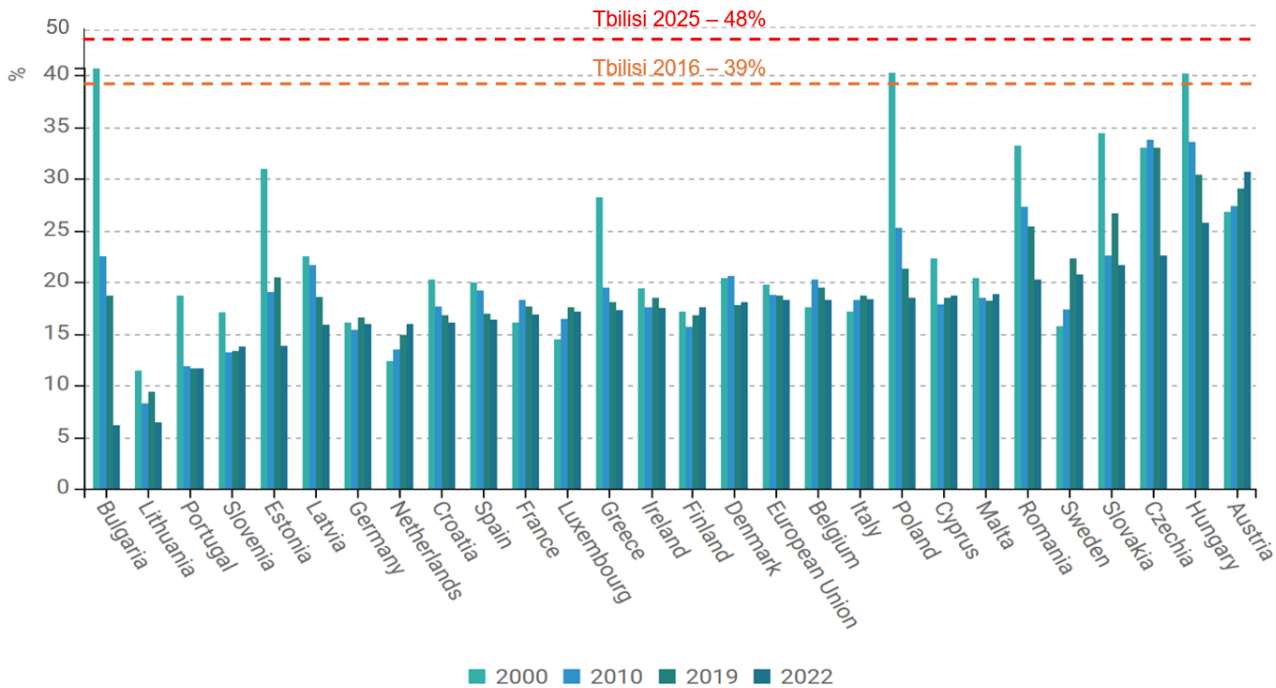
Only 0.14% of trips fall under the “Any other” category, indicating that the predefined options largely captured the spectrum of transport modes used. Overall, the data reflects a strong public transport dependency, with moderate private car use and limited reliance on alternative modes.

Figure 15 - Main mode of transport used



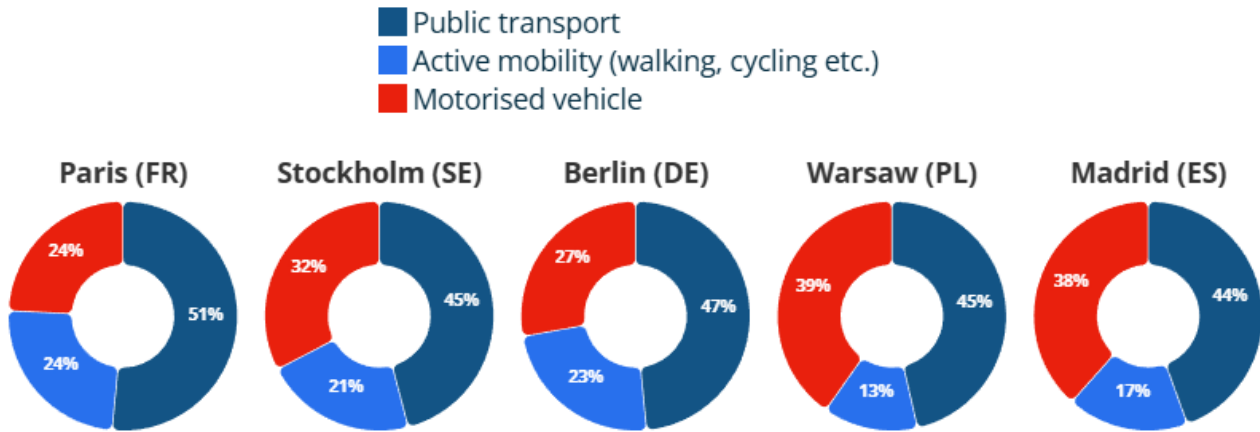
A comparison with European-level statistics confirms the relevance of this figure.

Figure 16 - Share of public transport in total passenger traffic (Source: Odyssee-Mure.eu)



Another interesting comparison is made with 5 major cities in Europe: Paris, Stockholm, Berlin, Warsaw and Madrid. As highlighted in the next Figure 17¹⁷, use of public transport as the main mode is comparable to that observed in Tbilisi.

Figure 17 - Main mode of transport used for daily commuting in 5 European cities

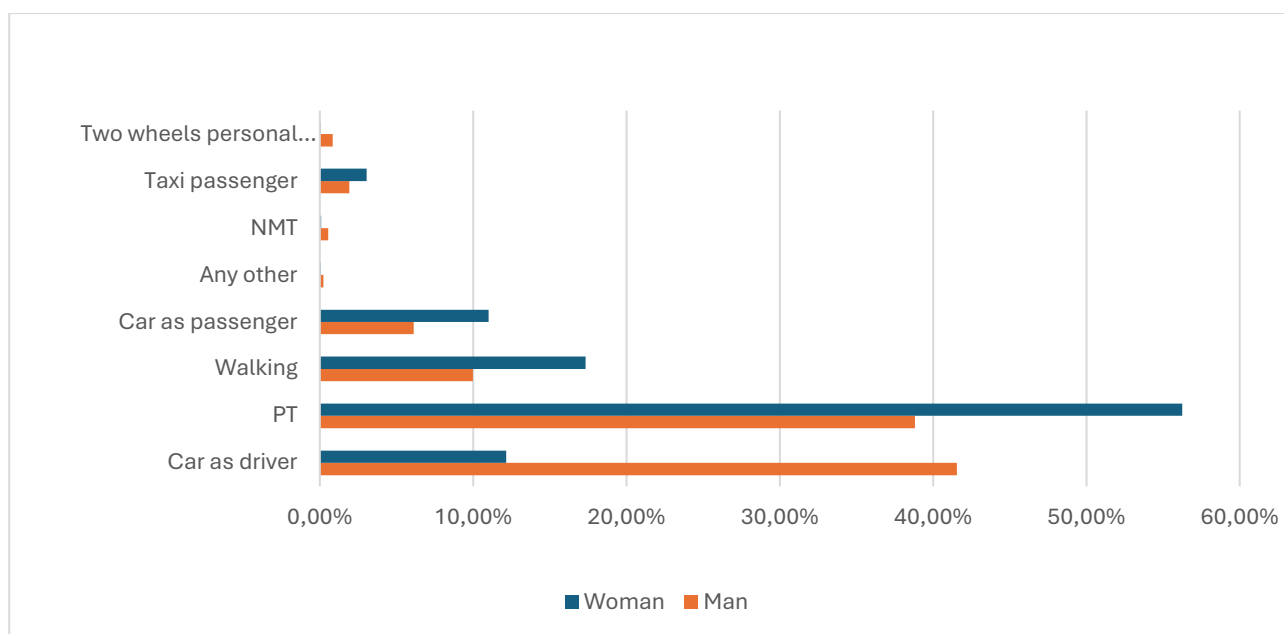


The analysis of the primary mode of transportation reveals highly significant and interesting data when considering the gender of respondents. As clearly highlighted in the following report, 56% of women use public transport as their main mode of travel. This finding can be interpreted in several ways:

¹⁷ Source: European Mobility Expo 2024

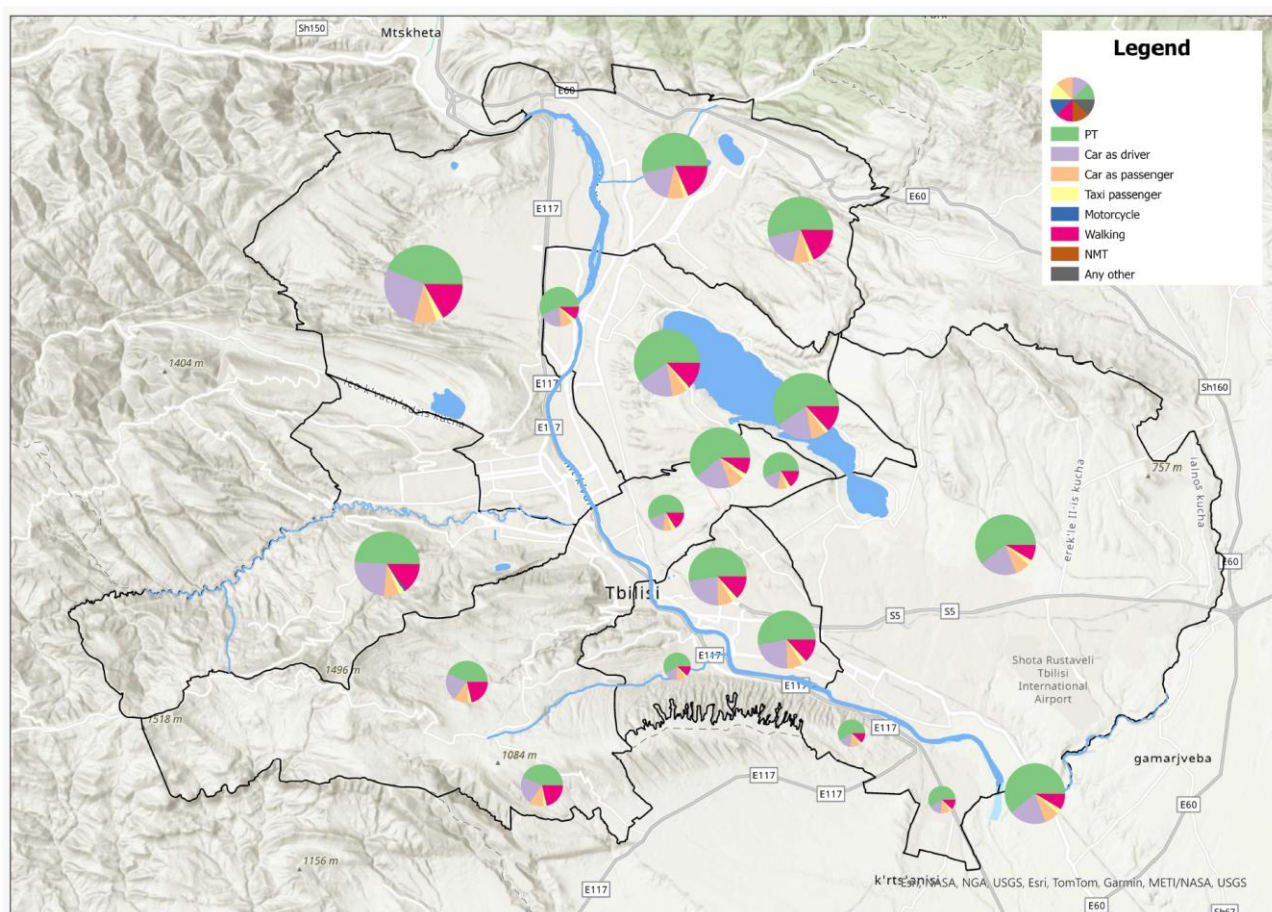
- Such a high percentage indicates an extremely strong level of sustainability and could serve as a cornerstone for mobility planning in Tbilisi within the framework of the Tbilisi Transport Plan (SUMP)
- this high value is undoubtedly linked to the limited availability of private vehicles among women; and
- the fact that one in ten women has experienced harassment on public transport (see **Errore. L'origine riferimento non è stata trovata.**) necessitates the definition and implementation of targeted measures to ensure safety and avoid such episodes.

Figure 18 - Main mode of transport by gender



With reference to the modes of transport used by respondents, representative of urban mobility given the characteristics of the sample, another particularly noteworthy data point concerns the **modal split**. To balance the analytical significance with the readability of a potential cartographic representation, it was deemed reasonable to prepare a map based on the Raioni.

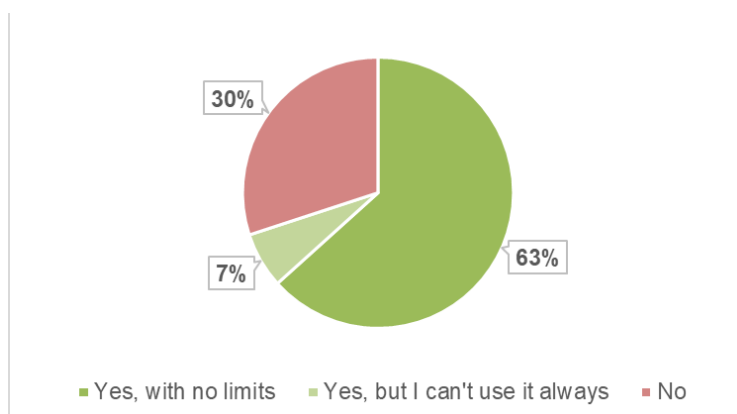
Figure 19 - Modal split per Raioni



An initial reading of the data reveals several noteworthy aspects, which should be interpreted with the understanding that the analysis includes every means of transport used, regardless of whether it was identified as the primary one or not:

- Public transport (PT) accounts for nearly 50% of trips in almost all areas, with very few exceptions, primarily in districts where motorization rates are particularly high.
- While the use of private cars is consistently high, consistently close to or even above 50%, it is important to note that a quite important share of these trips is made by passengers rather than drivers. This distinction should always be considered in any analysis or evaluation.
- Walking reaches much higher percentages than those reported as the main mode of transport, which highlights its widespread role as a feeder mode. When answering the question about their “main mode of transport”, most respondents who walked to a public transport stop and then used PT likely selected “Public Transport” as their main mode. However, in the detailed trip leg descriptions provided in the questionnaire, many of these respondents also indicated “walking” as a part of their trip, which significantly increased the overall share of walking recorded in data.
- In every area, taxi use is also noticeably present. This appears to be more closely linked to limited car availability than to deficiencies in public transport, as the trend is observed even in well-served areas.

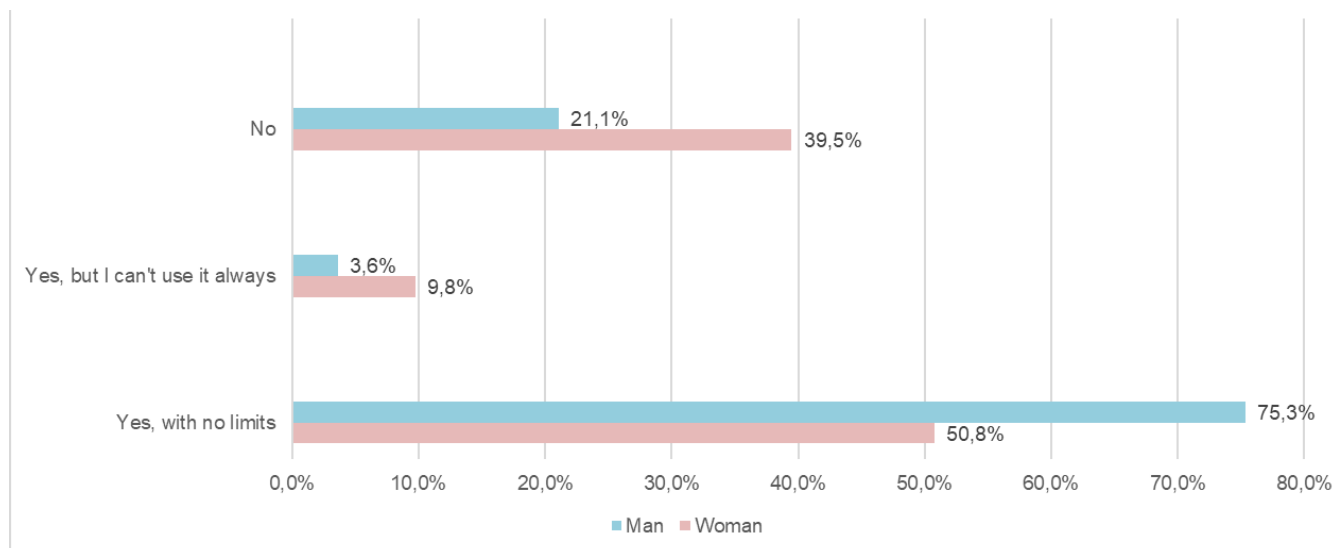
Figure 20 - Availability of a private car



The relatively **low rate of private car** use as the main mode of transport becomes even more noteworthy in the context of developing a Sustainable Urban Mobility Plan when considered alongside respondents' full access to a private vehicle. In fact, although 63% of respondents reported having unrestricted access to a private car, only about two-thirds of them use it as their primary mode of transportation.

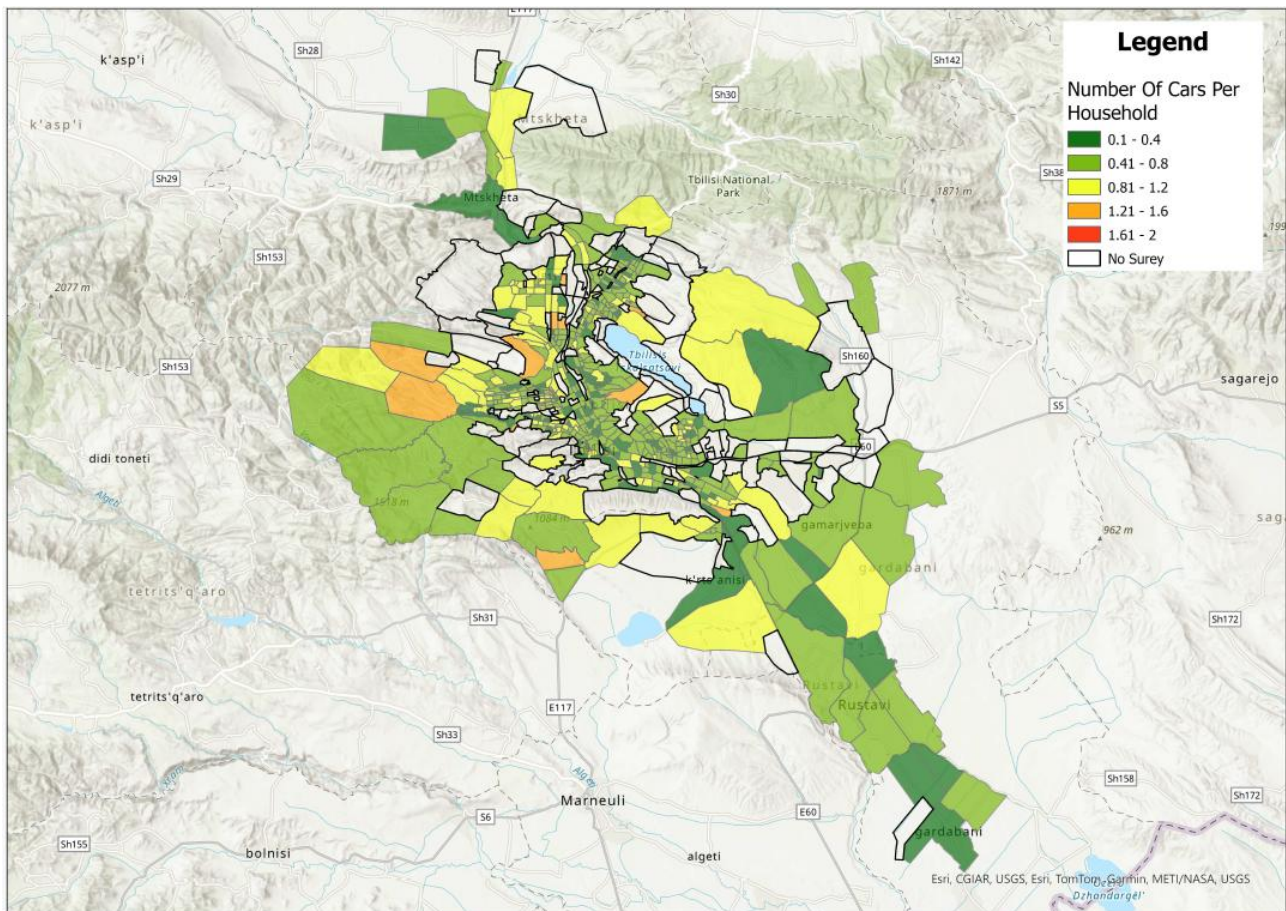
The actual availability of a car varies significantly by gender and undoubtedly impacts not only the frequency and number of trips made but also, most importantly, the primary mode of transportation used. In fact, it is quite logical to interpret this data in conjunction with the mode of transportation used: men, who more frequently have access to a private car, tend to travel more often by this means, whereas women, who have less access to a car, are much more likely to rely on public transportation.

Figure 21 - Car availability by gender



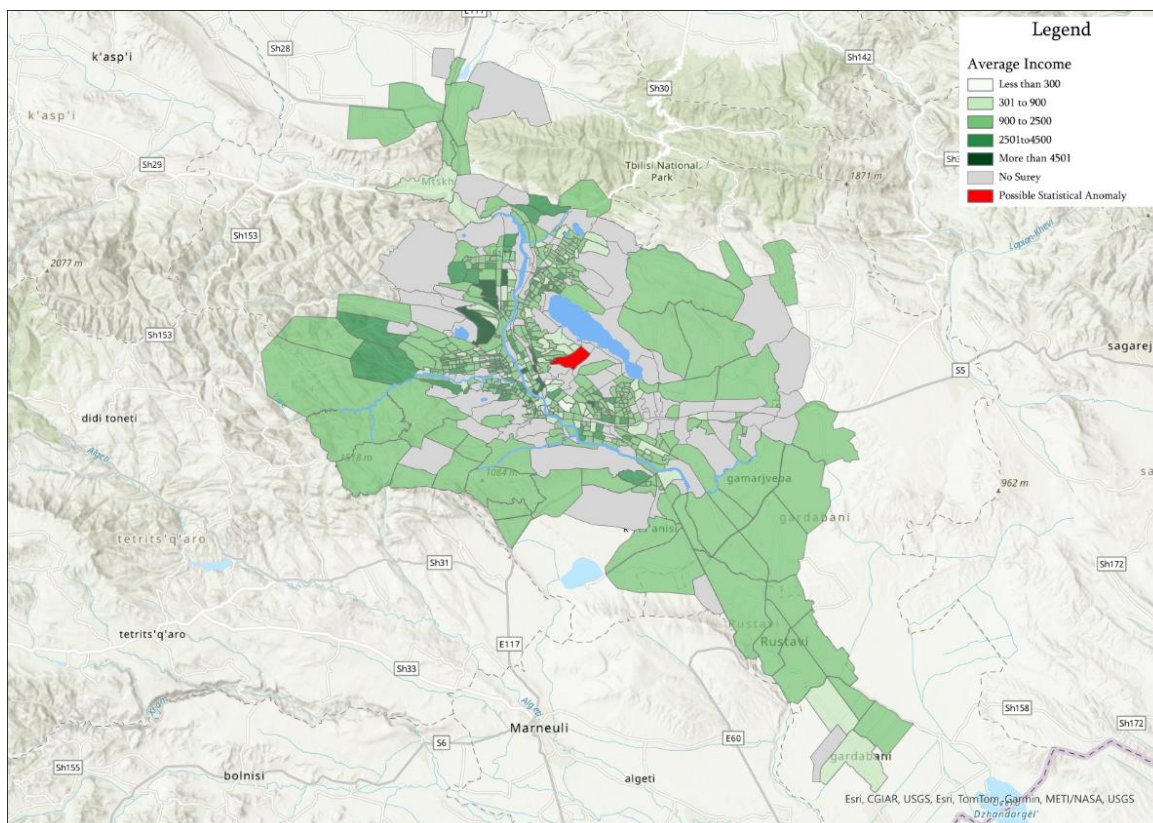
It is interesting to observe how the number of vehicles per household can vary significantly in the different zones of the city. These differences may be influenced by factors such as the level of urbanization or, mainly, the average household income. As shown in the analysis below, most areas report fewer than one car per household, with values exceeding this threshold only in a few zones—mainly concentrated in the city center and the western parts of Tbilisi. Vehicle ownership tends to be lower primarily in the outer southern and northern outskirts of the city, with fewer than four out of five households owning a car on average. However, a few less frequent cases can also be observed in some central areas.

Figure 22 - N° of cars per Household per area



The map below confirms what is, in fact, quite intuitive: even in Tbilisi, there is a strong correlation between average income levels and motorization rates. However, one specific area shows an unusual pattern, which is likely the result of a statistical anomaly (the red area).

Figure 23 - Average Income per area

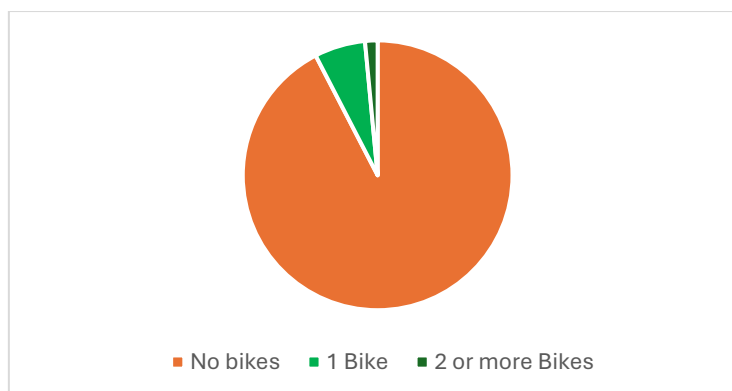


Still in relation to the vehicle fleet, one particularly noteworthy figure from a sustainable urban mobility perspective is the extremely **low level of bicycle ownership**. As shown in the following chart, 92.4% of households do not own a bicycle. This finding deserves attention from different perspectives as it highlights the needs of:

- improvement of the city's cycling infrastructure
- increased safety of both existing and future cycling networks
- potential incentives for the purchase and/or use of bicycles.

Even lower percentages are also recorded regarding the number of motorcycles or e-scooters per household.

Figure 24 - Bikes per HH

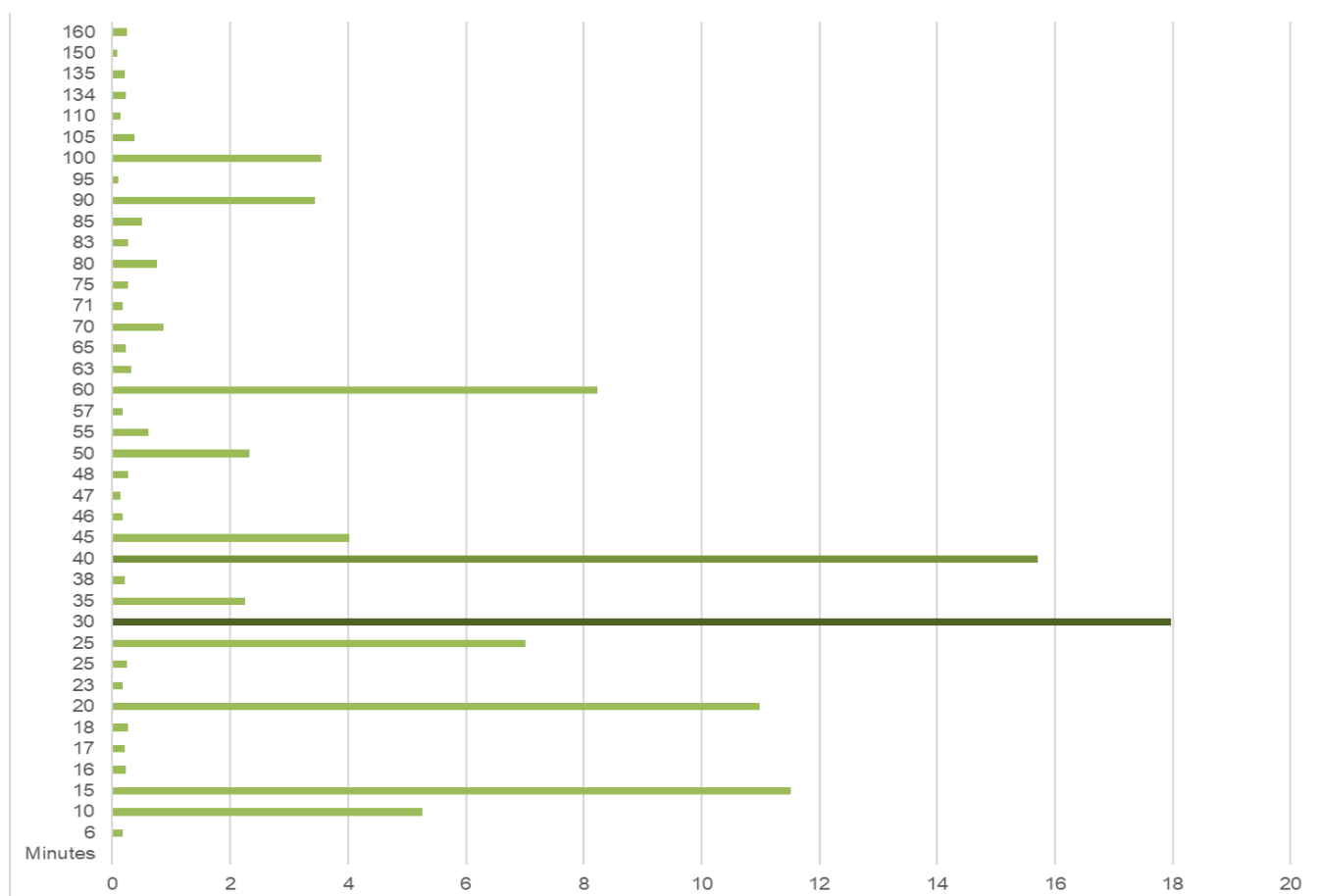


Another key data point regarding trips made on a typical weekday in the city concerns their **average duration**. While a peak can be observed at 30 minutes duration, it is important to note the wide

distribution of responses, likely influenced by a reasonable, predictable tendency among respondents to round to common intervals (e.g., 15, 20, 30, 40, 45, or 60 minutes).

Overall, it is possible to identify a grouping pattern where over 50% of trips last less than 30 minutes, and more than three-quarters fall under 45 minutes. Both thresholds appear consistent with the city's geographic scale.

Figure 25 - Average duration of trips



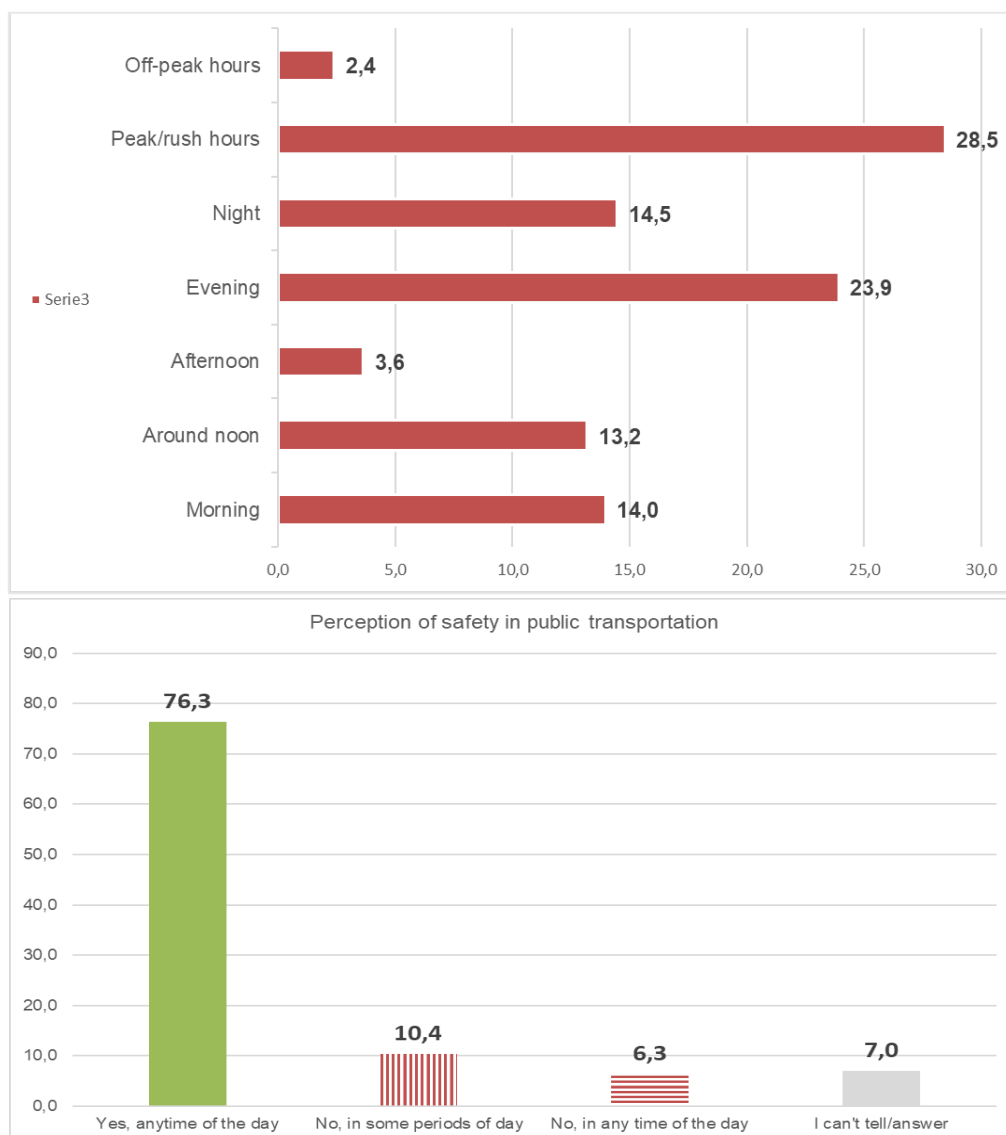
5.2.2 Safety on Public Transport

As previously mentioned, **safety** is a decisive factor in the choice of transport modes in Tbilisi. The survey intentionally focused on this aspect, and the findings are particularly revealing. In fact, 17% of respondents reported feeling unsafe on public transportation at least during part of the day, with a third of them always experiencing this feeling.

A follow-up question targeting those who reported feeling unsafe revealed that afternoon hours or periods with low ridership are perceived as relatively less problematic.

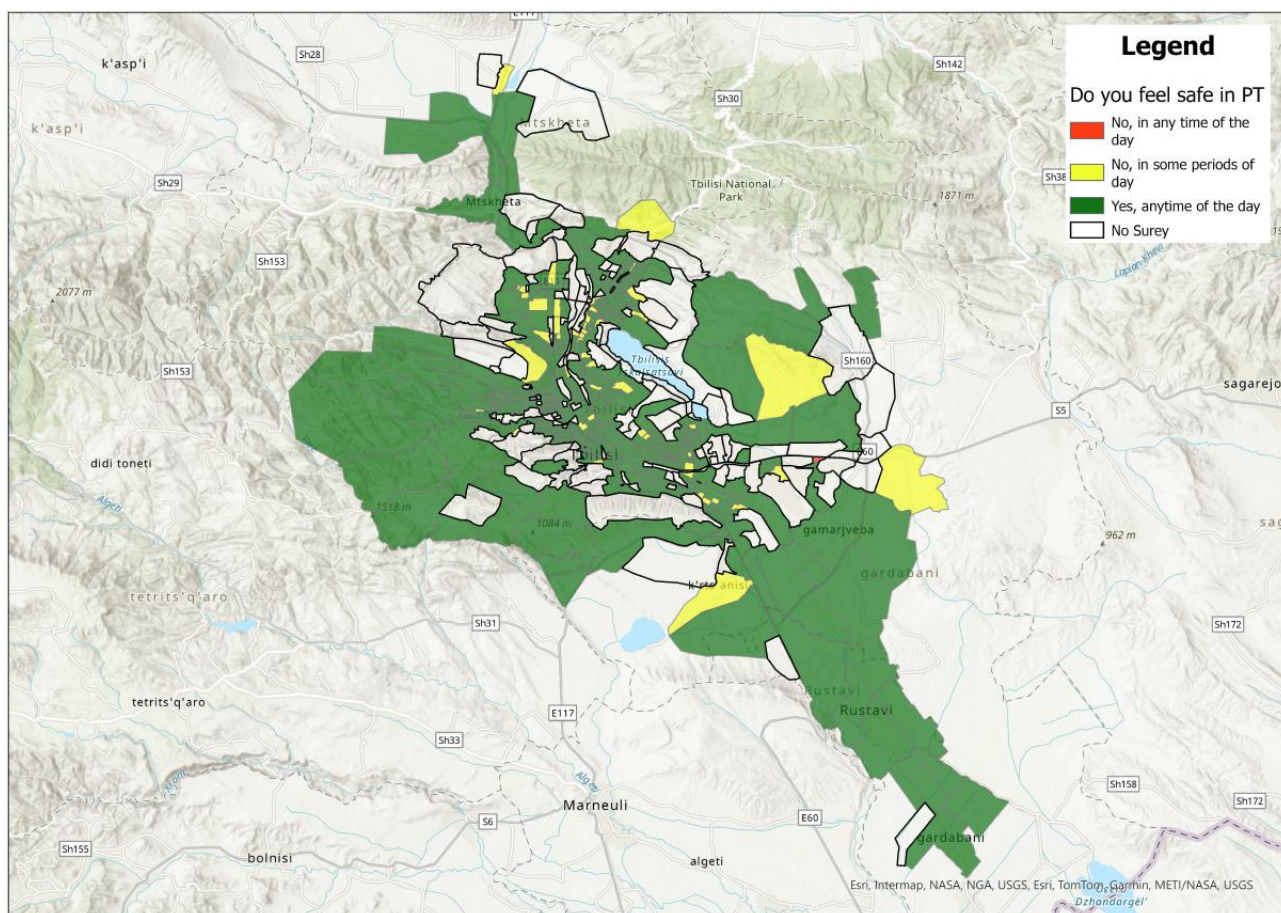
Conversely, one in four respondents stated they feel unsafe in the evening or during times of high passenger volume. These periods are considered significantly less comfortable, even more so than nighttime travel.

Figure 26 - Perceived lack of safety on PT, during the day



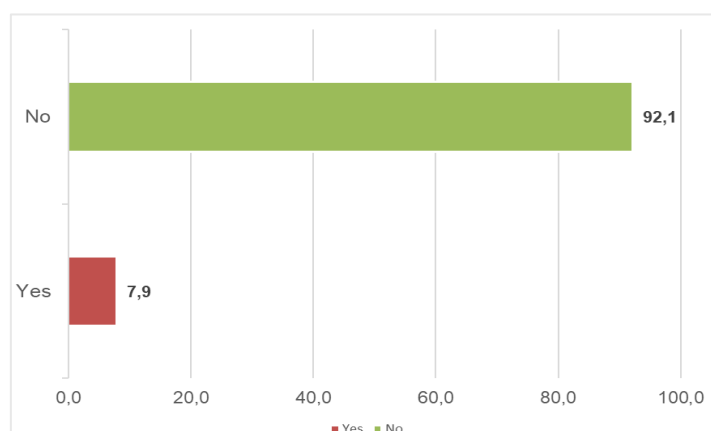
A cross-analysis of perceived safety aboard public transportation and the geographical distribution of respondents allows for easy identification of the few areas where responses to this question were slightly less positive. Only in one very small area is there a concentration of responses indicating feelings of insecurity throughout all times of the day. However, this finding should be interpreted with caution, as the surrounding areas report significantly less critical perceptions of safety on public transport. Given the limited size of this zone, it is even more likely that it represents an exception, or that the less positive result could be attributable to a potential statistical bias.

Figure 27 - Perception of safety on PT per area



As illustrated in Figure 266, the percentage of people reporting feeling unsafe on public transportation at least during part of the day is just under 17%. In contrast, the share of those who report having experienced harassment or knowing someone who has is much lower, at 7.9%. Therefore, it is important to take action to reduce the overall sense of insecurity among passengers, and especially to lower and eliminate the percentage of individuals who have experienced harassment or know someone who has.

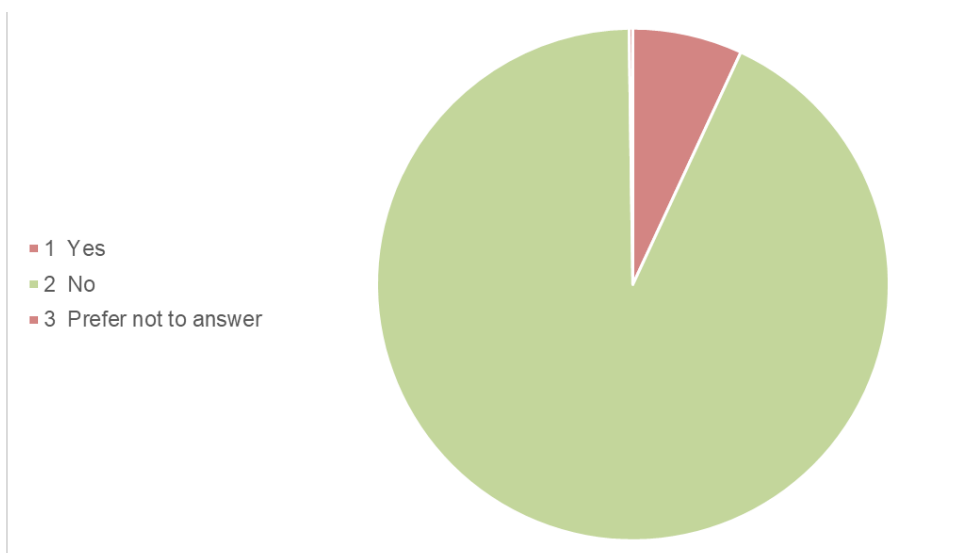
Figure 28 - People who experienced harassment or know someone who has



5.2.3 People with disabilities or specific conditions affecting mobility

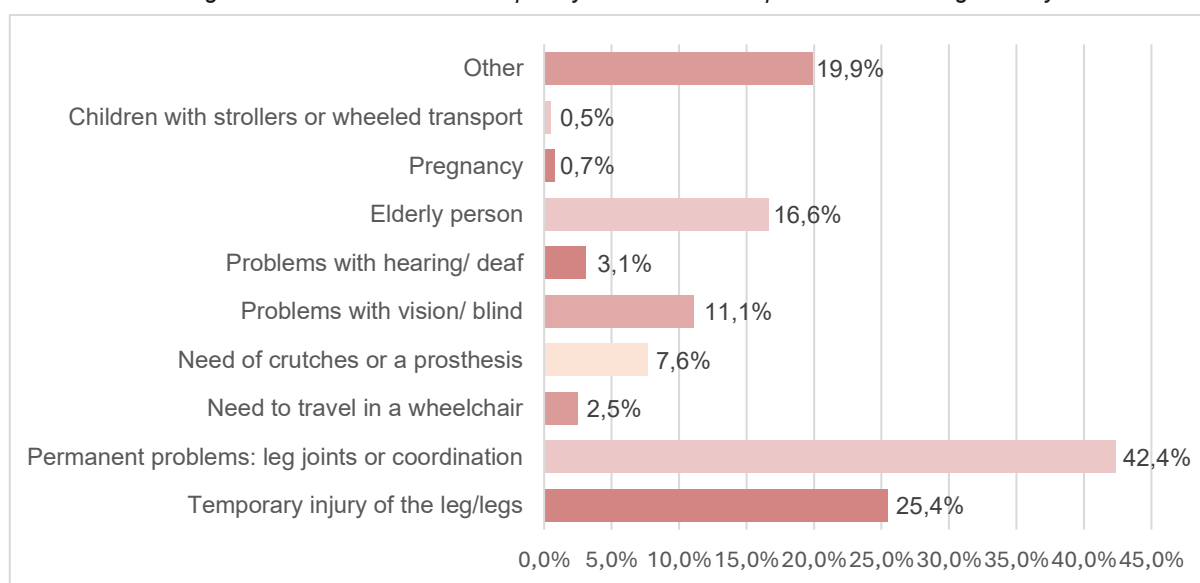
Another aspect to which the HHS paid particular attention concerns **individuals with any form of disability or conditions**, whether permanent or temporary, that may have **affected or could affect** their **ability to use the various available transportation modes**, or the ease with which they can do so. While this group also includes those who reported having a temporary condition (such as pregnancy or injury), the percentage of people falling into this subgroup, 6,9%, aligns with figures found in “unofficial” yet reasonably reliable sources.

Figure 29 – Share of people with disability or specific conditions affecting mobility



The in-depth analysis reported by respondents in this portion of the sample shows that the topic was appropriately approached by considering any condition that may affect an individual's mobility. This approach aligns well with the concept of **universal accessibility**, which aims to ensure that all individuals can access transportation services without facing greater challenges or barriers than others.

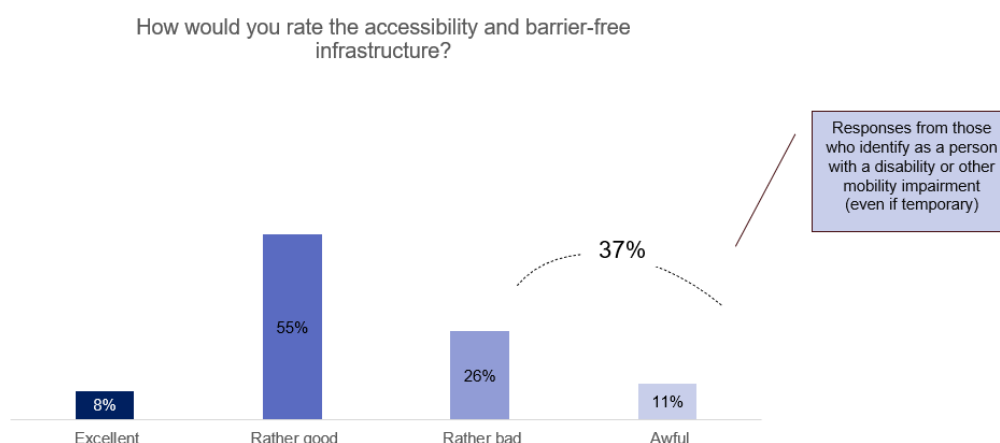
Figure 30 - Disabilities and temporary or non-visible impairments affecting mobility



Maintaining the guiding principle of the universal accessibility, it is certainly important to identify and characterize the elements that may have influenced or continue to influence the experience of individuals with any form of disability or specific condition affecting mobility when moving around the

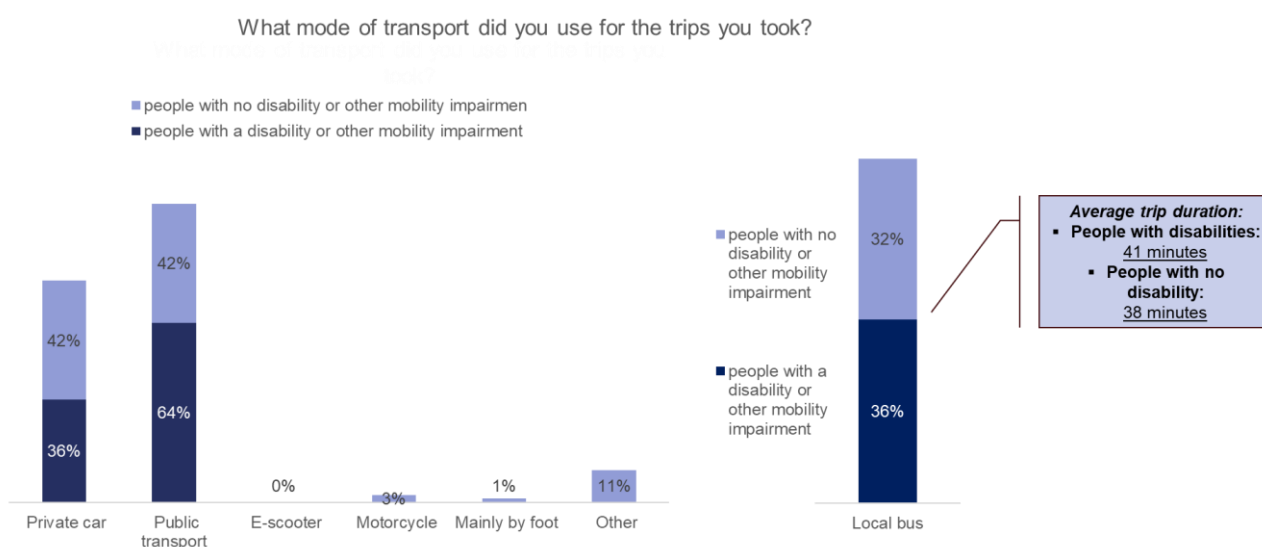
city. While the HHS did not allow for a highly detailed investigation that could pinpoint specific deficiencies in infrastructure or mobility services, the perspective of this respondent group was nevertheless gathered, at least regarding the perceived accessibility of the transportation systems. The findings are undeniably significant and should prompt follow-up action: 37% of respondents expressed either a negative or even extremely negative evaluation. The fact that more than one-third of this population highlights serious shortcomings must serve as a point of reflection and as the starting point for a process that, while complex, is both ambitious and commendable, and ultimately necessary. Such a process should aim to thoroughly assess existing issues within the transportation systems and, most importantly, to design and implement targeted mitigation measures.

Figure 31 - Level of accessibility of mobility options



Moreover, individuals with disabilities rely more heavily on public transportation, with 64% reporting its use compared to 42% among those without disabilities. The local bus is the most used mode (36%), and the average trip duration is slightly longer for people with disabilities (41 minutes versus 38 minutes), possibly reflecting more complex or indirect travel routes.

Figure 32. Mode of transport by people with mobility impairments

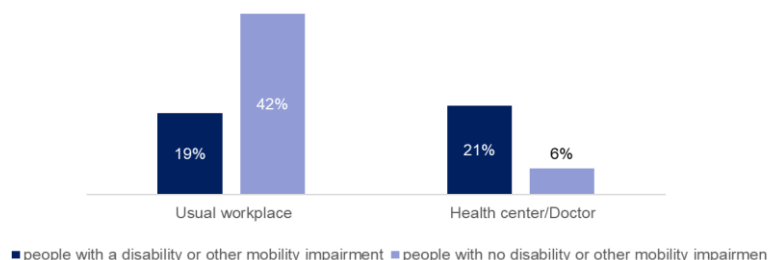


Travel purposes also diverge notably. Among people without disabilities, 42% report commuting primarily for work, whereas only 19% of people with disabilities do so. Instead, health-related travel

represents a significant share of this group, with 21% indicating medical visits as their main purpose of travel. This pattern reflects broader disparities in labour market participation and service accessibility.

Figure 33. Travel purposes by people with mobility impairments

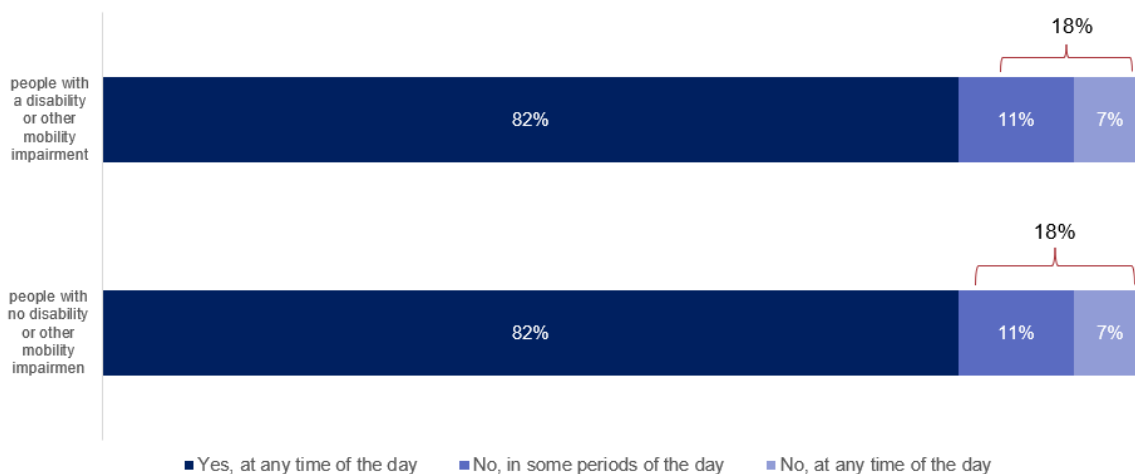
What better describes where did you head to in your trip?



In terms of **perceived safety**, both groups report similar levels of concern: 18% of respondents, regardless of disability status, feel unsafe during all or some parts of the day. This suggests that general improvements to safety conditions could benefit all users equally.

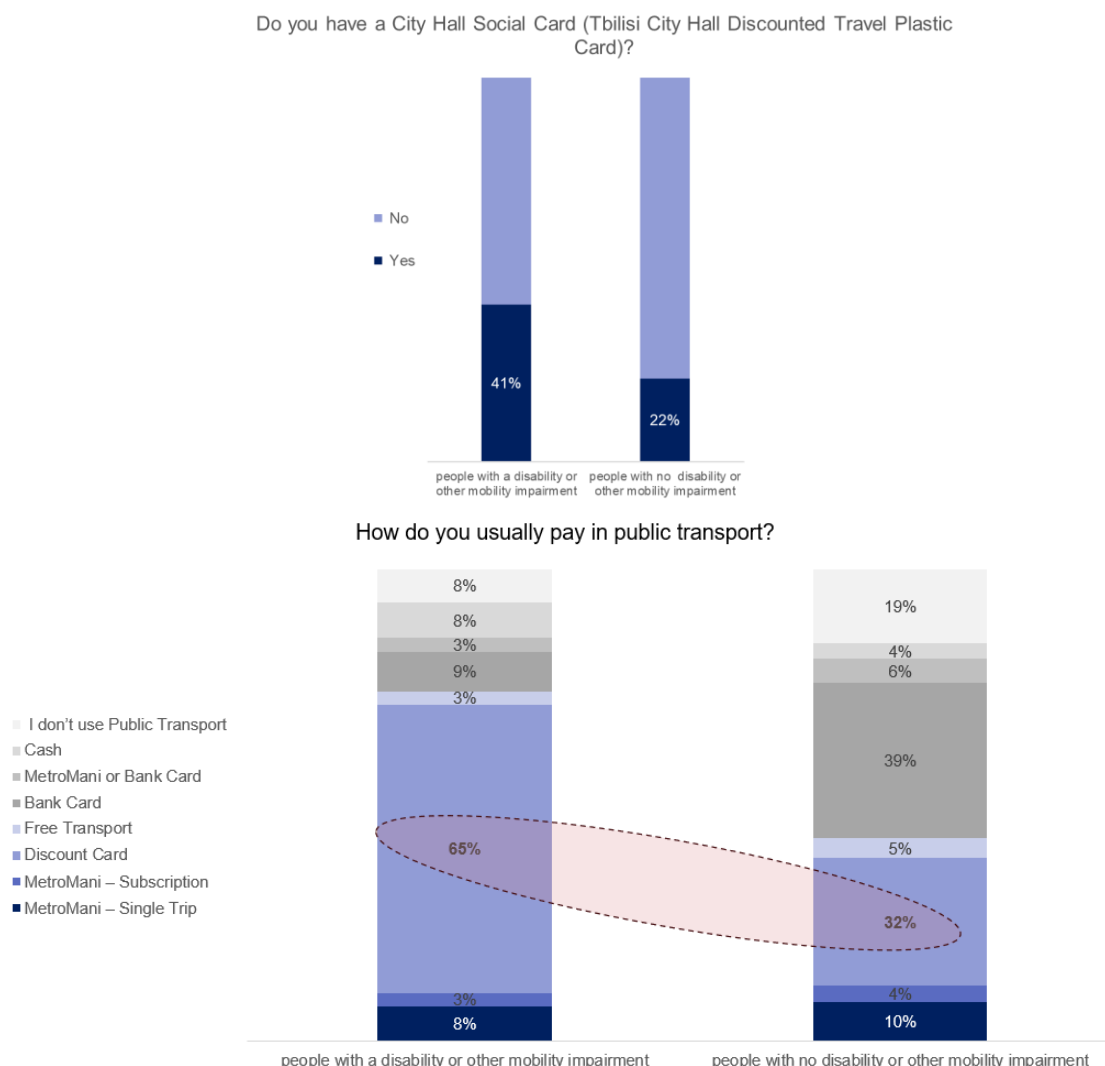
Figure 34. Safety by people with mobility impairments

Do you feel safe using public transportation during different times of the day?



Affordability appears to be a relatively minor factor for both groups, with 22% of respondents with disabilities and 20% of those without identifying cost as a key consideration in their transport choices. However, individuals with disabilities demonstrate greater engagement with financial support mechanisms: 41% of respondents with disabilities report possessing a Tbilisi public transport card, and 65% make use of some form of fare discount—more than double the rate observed among those without disabilities (32%). While this suggests a heightened reliance on financial support to ensure mobility, it may also reflect a targeted effort by public authorities to address the specific needs of people with disabilities through dedicated subsidies and concession schemes.

Figure 35. Affordability by people with mobility impairments



Interestingly, accessibility is not ranked as a top priority (20%) when respondents evaluate what factors influence the most the choice of public transport, trailing behind safety, comfort, and trip duration—regardless of disability status.

5.2.4 Gender Equality Analysis

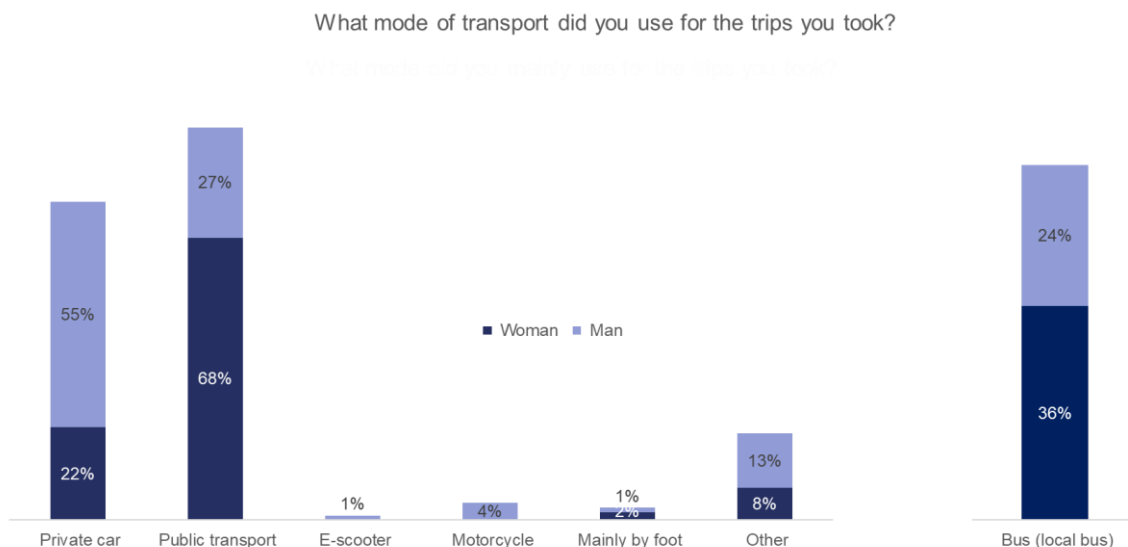
Although the assignment did not include provisions for dedicated data collection on gender equality and inclusion, available sex-disaggregated data allows for a preliminary interpretation that can support the development of a more inclusive and equitable transport system for Tbilisi, particularly in the context of the Tbilisi Transport Plan (SUMP). This process should aim to thoroughly assess existing issues within the transportation system and, most importantly, to design and implement targeted mitigation measures.

Data collected highlighted **gender differences** in travel patterns, needs, and perceptions of safety and affordability.

Women show a significantly **higher reliance** on public transportation, with 68% reporting its use compared to only 27% of men, who tend to prefer private vehicles. This disparity is further reflected

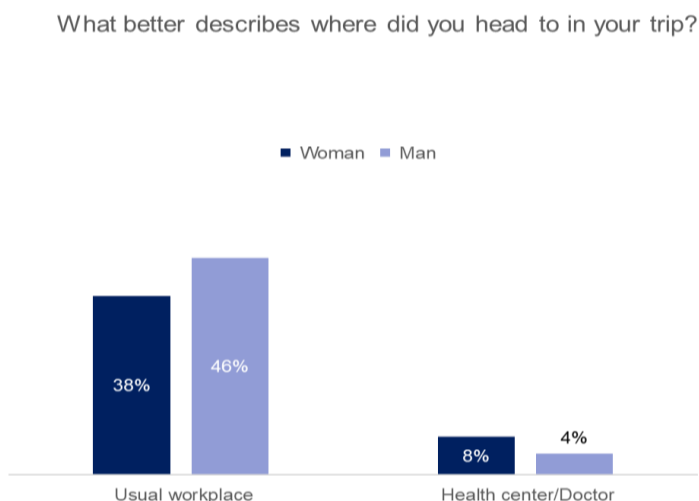
in modal choices, as 36% of women reported taking the local bus to reach the interview location, versus 24% of men.

Figure 36. Mode of transport by gender



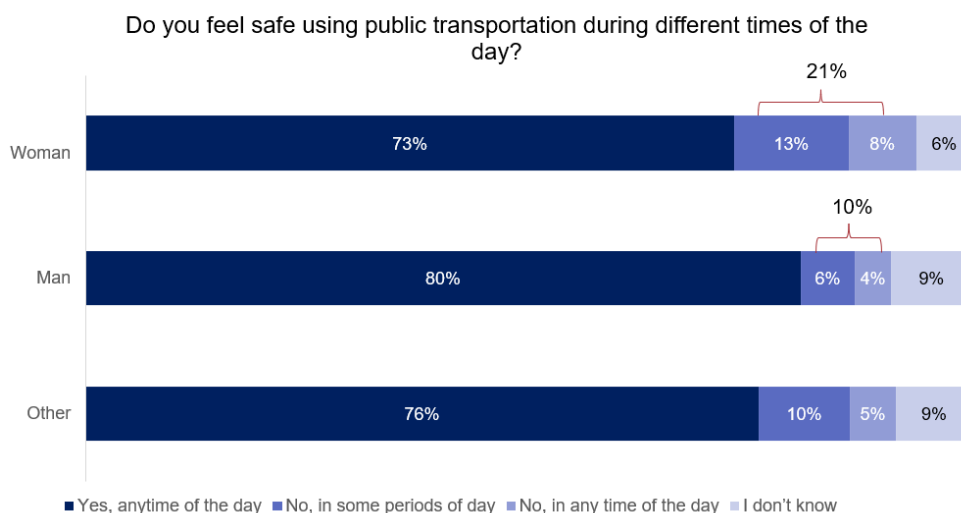
Travel purposes also differ by gender. A greater proportion of men (46%) report commuting for work-related reasons, whereas women are more likely to travel for health-related appointments, 8% compared to 4% of men. This may reflect gendered divisions in caregiving roles and access to formal employment.

Figure 37. Travel purposes by gender



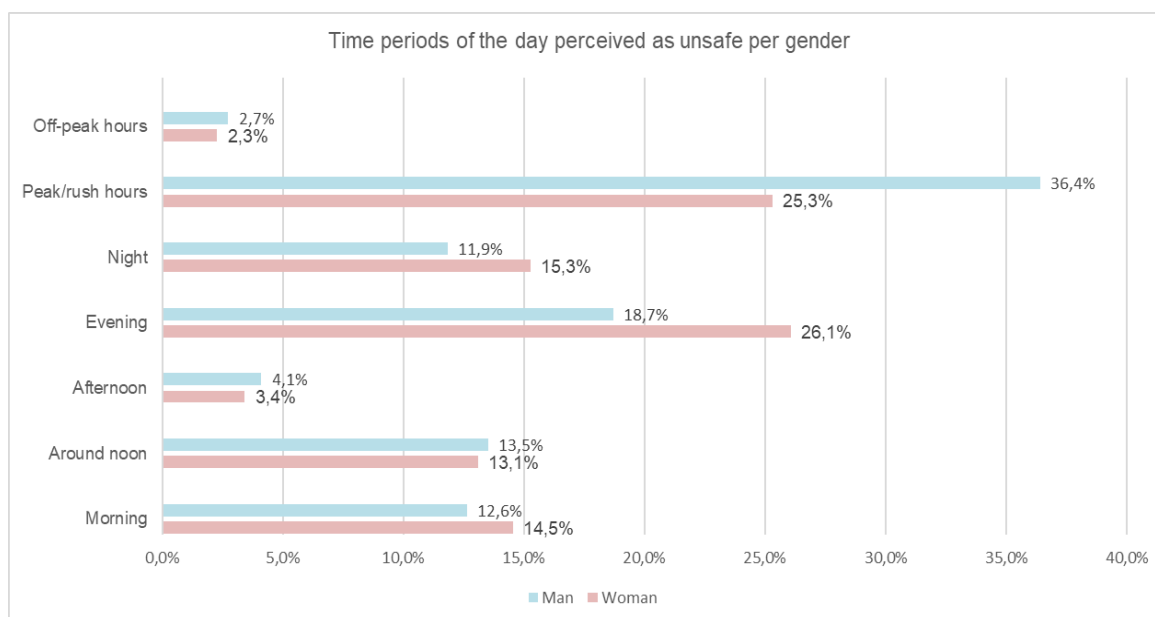
The issue of **safety** on public transportation often highlights significant gender-based inequalities. Findings from the HHS indicate that the percentage of women who report feeling unsafe on public transport across various periods of the day is as much as twice that of men: 21% of female respondents report not feeling safe using public transport at any time or during certain periods of the day compared to just over 10% of men.

Figure 38 - Perception of safety on PT by gender



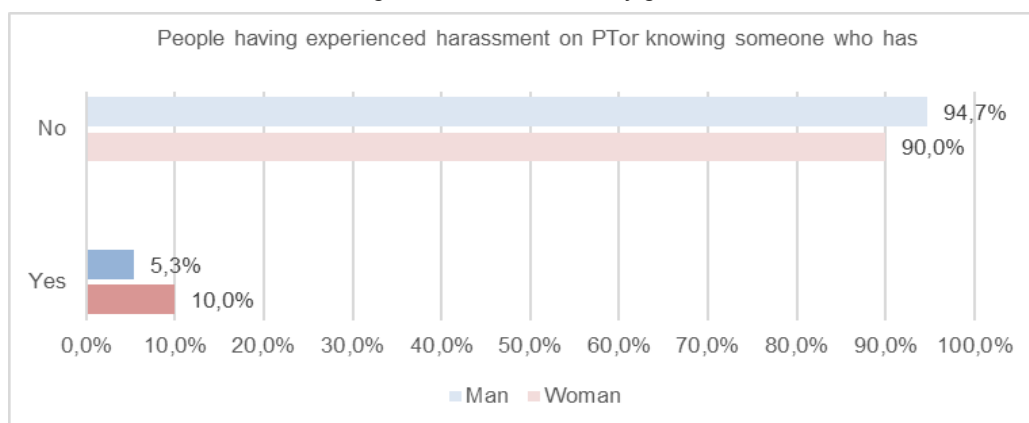
Regarding specific times of day, women clearly report a heightened sense of insecurity during the evening and night hours. Interestingly, however, most men indicate feeling unsafe primarily during peak hours, likely a reflection of the discomfort associated with high levels of crowding.

Figure 39 - Perceived unsafe periods of the day by gender



Moreover, nearly 10% of women know someone who has experienced harassment on public transport, nearly double the rate reported by men (5%), pointing to a higher exposure to or awareness of gender-based risks in transit environments.

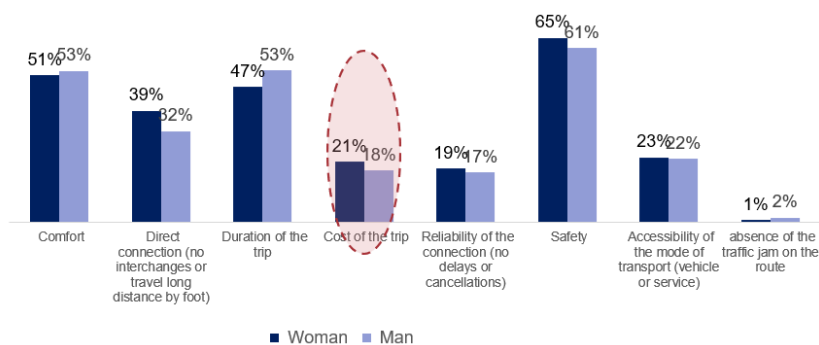
Figure 40 - Harassment by gender



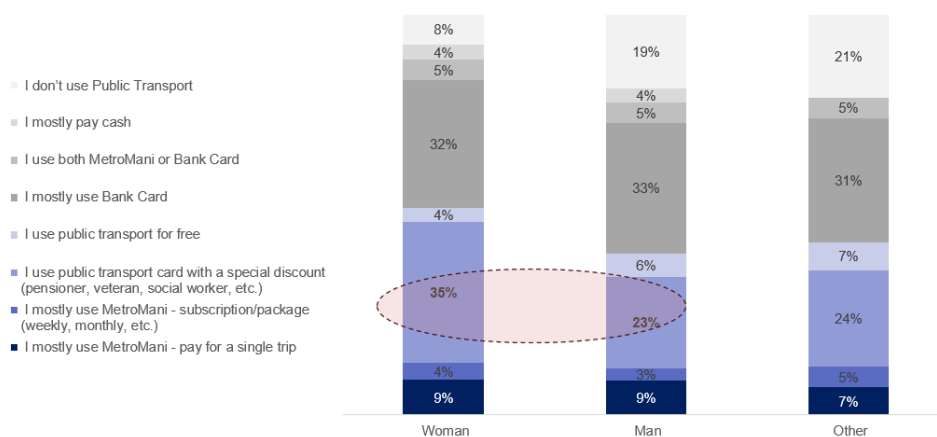
Affordability also appears to influence women's mobility choices more strongly. Women are slightly more likely than men to identify cost as a determining factor in their transport decisions (21% vs. 18%). They also appear more engaged with available subsidies: 26% possess a discount card, and 35% make use of some form of payment support, which may suggest greater sensitivity to transport-related financial constraints.

Figure 41. Affordability of transport costs by gender

What top 3 factors influence you when choosing the mode of transport (car, public transport, bicycle etc.) to travel in the city?



How do you usually pay in public transport?



6 CHALLENGES AND MITIGATION MEASURES

Before the programming and development of the activities for HHS completion, some challenges and risks were considered. The survey process demonstrated the validity of the concerns and confirmed that identifying appropriate mitigation measures was justified. Furthermore, there were more challenges that arose during fieldwork which were successfully overcome.

The following table summarizes challenges, their possible influence on the survey, and applied mitigation measures.

Table 9 - HHS Challenges and Mitigation Measures

Challenge	Possible Impact	Mitigation procedures
General Context		
Parliamentary elections held in Georgia on 26th October 2024 and their impact on the HHS activities	General public irritation and decreased willingness to engage in the survey	Schedule the HHS pre-pilot, pilot, and fieldwork activities after the elections to avoid peak political sensitivity and ensure better respondent cooperation.
Instability and civil activities after elections	General irritation and mistrust toward polls because of dissatisfaction with the election results Widespread mistrust of government institutions, particularly Tbilisi City Hall Absence from home was more frequent during this period, as some respondents were actively participating in civil activities, reducing the pool of potential respondents available for interviews. Suspicion regarding questions on mobility patterns resulted in concerns such as: "Are you asking this to find out if I attended the protests?" This led to intentional withholding or distortion of information.	Temporary Suspension of Fieldwork: Activities were paused during peak periods of instability to avoid biased data due to abnormal mobility patterns and low respondent availability. Staggered Resumption Strategy: Fieldwork resumed first in suburban and neighboring microzones of Tbilisi, which were less affected by protests. Data collection in central urban areas, identified as protest's hotspots, was postponed to a more stable period. Flexible Interview Scheduling: Interviews were rescheduled for different periods, days, or hours based on respondent availability and comfort. Enumerators were instructed to increase the number of call backs and follow-up visits to maximize participation rates. Replacement of Unreachable Households: Households that could not be reached after multiple attempts were replaced according to predefined sampling protocols. Sensitive Question Handling: Respondents were explicitly allowed to withhold specific trip purposes or destination addresses to ensure their privacy and encourage honest participation, especially

Challenge	Possible Impact	Mitigation procedures
		when discussing mobility, potentially related to different types of civil activities.
Survey Fatigue	As many respondents had recently been approached for multiple surveys, primarily political in nature, they felt oversaturated, which led not only to refusals but also to lower-quality responses, with some participants showing signs of disengagement or rushing through the interview.	Keep the questionnaire as concise as possible and schedule interviews at times that are most convenient for respondents, to reduce respondent burden and improve participation rates.
Statistical Data		
Unavailability of receiving detailed data required to optimize the number of microzones	Reduced representativeness of the population; challenges in appropriately allocating the number of interviews per zone.	Interviews were distributed equally, and fieldwork was adjusted based on the specific characteristics of each zone during implementation.
Absence of information regarding population, their age and gender groups in identified microzones	Impossibility to apply specific information mentioned for data weighting purposes.	Use the available data on the population and its breakdowns per age and gender for Tbilisi and neighboring areas, selecting the most reliable sources possible.
HHS Field		
Enumerators leaving the field after termination of work (involvement in other activities)	Additional effort to train replacements, keeping the same pace of fieldwork after pausing	Conduct both refresher and full training sessions before resuming work to ensure consistency and quality
Lower-than-expected number of respondents reporting a trip the previous day	Insufficient data for transport modelling	Instruction was revised to allow collection of trip data not only for the previous day but also for the day before, if no trip occurred during the previous day
Difficulties in recalling the trips from previous days	Reduced completeness of information for transport modelling	Allow more time for respondents to recall; Enumerators assisted respondents by identifying nearby landmarks or buildings to help specify locations more accurately.
Difficulties involving other household members after spending time at the household and explaining the questionnaire	Reduced completeness of information for transport modelling	Assure respondents that every household member's experience matters and that their input is crucial for improving Tbilisi's transport system.
Incorrect GPS coordinates of households	Reduced accuracy of "home" location data, which is important for the distribution of interviews in microzones and, for the describing route	Check of GPS coordinates. In case of mistake, plan additional interviews to complete the microzone.

Challenge	Possible Impact	Mitigation procedures
People with disabilities		
Identifying all forms of disability, including temporary or non-visible impairments.	Limiting the sample size because of a subjective interpretation of disability	Interviewers were trained to explore the preliminary phase of the interview in greater depth, to clarify for respondents all forms of disability relevant to this part of the survey.
Deepening and detailing the analysis of their habits and of the difficulties faced when travelling in the city	Limited representativeness of the sample due to the low number of questions and the level of detail they addressed	The interviewers were specifically trained to record the responses as accurately and thoroughly as possible

7 LESSONS LEARNED

The survey implementation process provided several important insights that can enhance the planning and execution of future fieldwork:

1. **Impact of Interruptions on Fieldwork Pace:** due to unexpected interruptions caused by civil activities and the temporary suspension of field activities, the pace of work slowed during the initial weeks after resumption. This slowdown was primarily the result of having to train new enumerators, which delayed the return to full operational capacity. To address this in future projects, it is recommended to allocate additional time following any disruption to allow teams to regain momentum effectively.
2. **Optimal Timing for Fieldwork:** to minimize disruptions and improve the efficiency of data collection, future surveys should be planned during optimal fieldwork periods — ideally from September to November and March to May. These months offer more favorable weather conditions and coincide with fewer public, school, and university holidays, leading to better staff availability and higher respondent accessibility.
3. **Avoiding Fieldwork During Sensitive Periods:** to maintain the reliability of survey data and avoid public skepticism, it is crucial to complete fieldwork before sensitive events, such as elections. These events can create an atmosphere of uncertainty, reduce respondent trust, and potentially affect their willingness to participate or respond honestly. Planning around the political calendar can help protect data integrity and public cooperation.
4. **Importance of Location and Microzone Assessment:** pre-fieldwork assessment of survey locations and microzones is essential for effective planning. In some cases, insufficient knowledge of the field areas led to logistical difficulties and inefficiencies. Using satellite maps or GPS data, conducting site visits, or gathering localized intelligence ahead of deployment can help identify potential challenges, optimize routing, and allocate resources more effectively.
5. **Use of Robust Statistical Data in Planning:** waiting for and utilizing reliable, up-to-date statistical data before launching field activities contributes to more accurate targeting and better-informed decisions. In areas where planning was based on outdated or incomplete information, fieldwork was less efficient. Using solid data for zoning and sampling frames improves both operational efficiency and data quality.
6. **People with disabilities or mobility impairments.** This specific group of respondents showed a strong level of participation. However, while the data collected offers an important initial perspective, it remains limited in scope. To develop a truly **inclusive and evidence-based approach to universal accessibility**, a more in-depth survey would be highly beneficial. Such an effort should aim to directly engage representative disability associations and reach a broader and more diverse sample of individuals with various types of impairments.
Given that **Universal Accessibility** should be designed to meet the needs of all users regardless of ability, future investigations should adopt a more detailed and inclusive methodology. This would allow for better identification of specific needs related to physical infrastructure, service design, communication systems, and safety. In doing so, future planning efforts can move beyond compliance and toward genuinely inclusive design principles that empower all residents to participate fully in urban life.
7. **Gender Equality.** Preliminary findings from sex-disaggregated data reveal significant gender-specific patterns concerning Tbilisi's urban transport system, pointing to structural inequalities in access and use, which should be addressed in future planning.

Among the most urgent considerations is the issue of **safety and gender-based violence (GBV)** in the transport environment, which highlights the need for targeted interventions. These should include awareness-raising campaigns to promote respectful behavior, training for transport staff on how to appropriately respond to harassment or safety incidents, and the implementation of accessible and confidential reporting mechanisms. These considerations strongly reinforce the need for a **Gender Action Plan (GAP)** as a strategic framework for inclusive urban mobility planning. The GAP should set clear objectives to address gender disparities in access, safety, and mobility. It must be supported by concrete actions, measurable indicators, and clearly assigned institutional responsibilities.

Finally, more in-depth surveys should be undertaken, as future transport planning should systematically incorporate both sex-disaggregated and disability-disaggregated data at all stages of the decision-making process.

ANNEXES

Annex #1 – HHS Questionnaire

Study on the Travel Habits of the Population in Tbilisi and Its Surroundings November 2024

Please read the following text to all respondents!

Hello, my name is -----, and I represent the company ACT. With the support of the Tbilisi City Hall, we are conducting a study on the travel habits and transportation experience of the population in the capital and its surroundings. Sharing your daily experience will greatly help us in studying the challenges related to travel and in implementing appropriate measures to improve the quality of transportation, as well as creating a safe, convenient, and sustainable transportation system. The survey is conducted in collaboration with Lattanzio KIBS and REDAS Engineering, with the support of the Asian Development Bank (ADB), and the collected information will be used to develop an updated demand model for city transportation.

Please participate in a brief face-to-face interview. The questions relate to your personal travel experience. Your honest answers will help us create an accurate understanding of the research topics.

Participants are selected randomly, and today we have reached you. I want to assure you that your responses will remain completely confidential. The answers will be analyzed collectively, and your individual opinion will not be revealed anywhere.

Your participation in the study is voluntary. Even if you agree to participate in the interview, you may choose not to answer any question you find undesirable or may stop participating at any time. Before the interview begins, you can ask me any questions related to the study that will help you in making a decision.

May I begin the interview? (If agreed, thank them and start the interview.) Thank you very much for agreeing to the interview.

General Instructions for Interviewers:

- (1) All questions that do not indicate that multiple answers are possible are single questions.
- (2) Questions that do not state that they should be read aloud are not to be read aloud.

FILTER QUESTION

F1. How long have been you living in the neighborhood?

1. Don't leave here/ leave here temporary -> *finish questionnaire*
2. Up to 6 months -> *finish questionnaire*
3. Half year - year
4. 1-3 years
5. 4-10 years
6. 11 years or longer

Part 1: DEMOGRAPHICS

Scripter: *The following core questions should be addressed to the most informed member of the household (Section #1).*

D1. What is your type of household? (*interviewer: read out*)

1. Single
2. Couple, no children
3. Family with children
4. Couple with only older children (age 18 or more)
5. Multigenerational family
6. Single parent with young children
7. Couple, children separated
8. Other _____

D2. What is the total number of household members including all ages? *Under members of household, we mean all people that are usually spending in the household at least 4 nights per week.* /_____/

D3. How many people in the household are of age 14 or more? ____

D4. What is the total number of household members with regular monthly income?
/_____/ (mark 0 if none)

Interviewer: The table below is filled for all household members 14+:

	HH member	1	2	3	4	5	6	7	8
D3.1	Name and surname	_____	_____	_____	_____	_____	_____	_____	_____
		—	—	—	—	—	—	—	—
P.1	Gender								
	Female	1	1	1	1	1	1	1	1
	Male	2	2	2	2	2	2	2	2
	Other	3	3	3	3	3	3	3	3
	Prefer not to answer	4	4	4	4	4	4	4	4
P.2	Age								
	14-15	1	1	1	1	1	1	1	1
	16-17	2	2	2	2	2	2	2	2
	18-24	3	3	3	3	3	3	3	3
	25-35	4	4	4	4	4	4	4	4
	36-45	5	5	5	5	5	5	5	5
	46-55	6	6	6	6	6	6	6	6
	56-65	7	7	7	7	7	7	7	7
	66+	8	8	8	8	8	8	8	8
P2.1	Telephone number								

Scripter: Respondent response statuses

1. Selected respondent agrees – *I am the respondent* (interview completed)
2. Selected respondent agrees – *I am the caregiver* (interview completed)
3. Selected respondent refused the interview.
4. Selected respondent was not at home and will not be available during the fieldwork period.
5. Selected respondent was not at home or did not have time, and we agreed to conduct the interview on another day and time (**Scripter:** record the agreed day and time).
6. Respondent is unable to participate in the study due to mental health issues or severe illness.
7. Respondent is in a specialized institution or workplace: hospital, prison, military, or other.
8. Respondent has a language barrier.
9. Other reason.

D4. How many members of your household have a regular monthly income? /_____/ (**Interviewer:** mark 0 if none)

D5. What was the TOTAL HOUSEHOLD monthly average income over the last 6 months (including all types of income – salaries, pensions, social assistance, remittances, renting properties, etc.)?

1. No monetary income
2. Less than 300 GEL
3. 301 to 600 GEL
4. 601 to 900 GEL
5. 901 to 1.500 GEL
6. 1.501 to 2.500 GEL
7. 2501-3500
8. 3501-4500
9. 4501-5000
10. More than 5000 GEL
11. Refusal / Interviewer

PART 2: Vehicles in the Household

For Scripter: The following core questions should be addressed to the most informed member of the household (Section #2).

H1. How many private cars do you have in your household? Question is about those private cars/ pickups that you and members of your household usually use for your trips. /_____/ (**Interviewer:** indicate 0, if having none)

H2. How many motorcycles/ mopeds do you have in your household? /_____/ (**Interviewer:** indicate 0, if having none)

H3. What is the total number of bicycles in your household? /_____/ (**Interviewer:** mark 0 if having none)

H4. What is the total number of e-scooters in your household? / ____/ (**Interviewer:** mark 0 if having none)

PART 3: HOUSEHOLD MEMBERS

Scripter: Parts 3 and 4 should be asked consequently to each member of household of more than 14 years age. Parents could supervise answering of their kids' experience (for kids of 14-15) if needed.

Logic control: to ask this cycle of questions to all members that were counted in D3.

P1. What is your gender?

1. Woman
2. Man
3. Other
4. Prefer not to answer

P2. What is your age?

1. 14-15 years ->go to P4
2. 16-17 years
3. 18-24 years
4. 25-35 years
5. 36-45 years
6. 46-55 years
7. 56-65 years
8. 66 and more

P3. Do you have a driving license? (**Interviewer:** multiple choice, **Scripter:** skip if under driving age - 16+)

1. No
2. Yes, for motorcycles and/or cars
3. Yes, for motorcycles and/or cars and for the other categories as well

P4. What better describes your occupation? (**Interviewer:** code by meaning)

1. Working at full time job(s)
2. Working at part time job(s)
3. Working at both main and side jobs
4. Studying at school
5. Student (of university or vocational college)
6. Both studying and working
7. Unemployed, searching for job
8. Unemployed, not searching for job
9. Retired, not working
10. Retired, but working
11. Housewife/ houseman
12. In maternity leave
13. Other (specify)

Scripter:

If P4 = 1 - 3 or 6, or 10 → P5,

If P4 = 4-5 → P6

If P4 = else → P7

P5. Is your main or side job connected to frequent travels by city (courier, taxi driver, bus driver, salesman etc.?) (**Interviewer: read out**)

1. Yes
2. Partly (have both tasks/job connected to frequent travel and tasks/job in main entity)
3. No

P6. Do you work or study at home? (**Interviewer: read out**)

1. Yes, every day (or nearly every day)
2. Yes, but partly (about 2-3 days a week)
3. Only occasionally (1 time a week or less)
4. No

P7. What top 3 factors influence you when choosing the mode of transport (car, public transport, bicycle etc.) to travel in the city? Please select 3 factors and clarify which one of those factors is of the first importance, of the second importance, of the third importance.

	Level of importance		
	I	II	III
1. Comfort			
2. Direct connection (no interchanges or travel long distance by foot)			
3. Duration of the trip			
4. Cost of the trip			
5. Reliability of the connection (no delays or cancellations)			
6. Safety			
7. Accessibility of the mode of transport (vehicle or service)			
8. Other (specify)			

P8. Do you feel safe using public transportation during different times of the day? (**Interviewer: read out**)

1. Yes, anytime of the day
2. No, in some periods of day
3. No, in any time of the day
4. I don't know (*don't read*)¹⁸

Scripter: If P8 = 2 → P8.1 else P9

P8.1. During which part of the day you feel less safe in public transport? (**Interviewer: read out. Multiple choice**)

1. Morning
2. Around noon
3. Afternoon
4. Evening

¹⁸ The text "Don't read" is an instruction for interviewers.

5. Night
6. Peak/rush hours
7. Off-peak hours

P9. Do you have any acquaintances or friends, who experienced any form of harassment while using public transportation in the last 6 months?

- 1) Yes
- 2) No

P10. How do you usually pay in public transport?

1. I mostly use MetroMani - pay for a single trip
2. I mostly use MetroMani - subscription/package (weekly, monthly, etc.)
3. I use public transport card with a special discount (pensioner, veteran, social worker, etc.)
4. I use public transport for free
5. I mostly use Bank Card
6. I use both MetroMani or Bank Card
7. I mostly pay cash.
8. I don't use Public Transport

P11. Do you have a City Hall Social Card (Tbilisi City Hall Discounted Travel Plastic Card)?

1. Yes
2. No

P12. Do you identify as a person with a disability or other mobility impairment, even if temporary?

1. Yes
2. No -> go to P13
3. Prefer not to answer -> go to P13

P12.1. Please choose all options that suit your experience: (**Interviewer:** read out. multiple choice)

1. Temporary injury of the leg/legs
2. Permanent problems with leg joints or coordination
3. Need to travel in a wheelchair
4. Need to move around with crutches or a prosthesis
5. Problems with vision/ blind
6. Problems with hearing/ deaf
7. Elderly person
8. Pregnancy
9. Small children (need to use strollers or children's wheeled transport)
10. Other _____

P12.2. How would you rate the accessibility and barrier-free infrastructure (e.g., Sidewalks and Pathways, Transit Stops and Stations, Public Transportation Vehicles, Elevators and Escalators, Signage and Wayfinding, Lighting and Safety Features, Parking and Drop-off Areas, Digital Accessibility) in your local area? (**Interviewer:** read out)

1. Excellent
2. Rather good
3. Rather bad
4. Awful

P13. Yesterday did you make any trip in the city? we refer to movement using any form of transportation (bus, metro, bicycle, scooter, private car, etc.) and on foot, if the respondent walked a distance of approximately 500 meters or more. This does not include walking short distances, such as moving within one's own neighborhood— for example, walking the dog around the house or block or going to the nearest store.

1. Yes
2. No, even if I was in the city ->go to next person
3. No, because I was not in the city ->go to next person

Scripter: If P13=2 or 3, go to next member of household to continue interviewing Part 3&4

P13.1 *INTERVIEWER: Please note what day you would be talking about further:*

- 5) Monday
- 5) Tuesday
- 5) Wednesday
- 5) Thursday
- 5) Friday

Result of P13.1 = further to be mentioned as [DAY]

Scripter: *If P13=1 and H1>0 – go to P14; If P13=1 and P5 =1 or 2, go to P15, other - for each who had p15=1 – go to Part 4*

P14. In this [DAY], did you have a car of your household available to make your trips in the City?
(**Interviewer:** read out)

1. Yes, with no limits
2. Yes, but I had to agree with other household members on using it
3. No

Scripter: If P13=1 and P5 =1 or 2, go to P15 (if person has one of jobs related to frequent city travel), other - for each who had P13=1 – go to Part 4

P15. This [DAY] did you make frequent trips in the City related to your work (courier, taxi, driver, etc)?

1. Yes ->go to P16
2. No -> go to Part 4

P16. How many such trips did you have on this [DAY]?_____

P17. What mode did you mainly use to perform them?

1. Private car
2. Public transport
3. Bicycle
4. E-scooter
5. Motorcycle
6. Mainly by foot
7. Other

P18. In average, how long did those trips take? (the average duration, considering all trips made)
Please, _____(indicate in minutes)

PART 4: PERSONAL TRIPS

At this part we will talk more details about your yesterday trips – this [DAY]). Under “trip” we mean one travel from “door to door” – from home to some other aim of trip, like workplace, market, getting kid to school, university, cinema, etc).

For example, stopping to drop the children at school or to buy a goods for dinner on the way from the house to the workplace generates 2 trips: one from the house to the school/ shop and the other from the school/ shop to the workplace. But in this case there also would be one more trip to return home after work, so in total – 3 trips per that day.

If you have work connected to frequent trips and have already told about work trips – include here only travel to 1st point or office/ base, and back to non-work purpose, without all trips that you’ve already summarized in previous block.

T0. So, how many trips did you had this [DAY] / _____/
(START OF TRIP CYCLE)

T1. What best describes from where you STARTED your first trip (**Interviewer:** show card and ask the respondent to choose the appropriate answer option)? Code by meaning using provided codes Table C1

T2. What time did you START your ___ trip (in 24h format, HH:MM)? (**Interviewer:** indicate exact time if mentioned. If not, allow the respondent to recall the approximate time)

T3. Where did you START this trip (please clarify street name and number or adjacent street) _____

T4. What better describes where did you HEAD to in this trip (home, work, school, shopping center, hospital, etc.) **Interviewer:** Code by meaning using provided codes (see Table C1)?

T5. What time did you ARRIVE there (in 24h format, HH:MM)? (**Interviewer:** indicate exact time if mentioned. If not, allow the respondent to recall the approximate time)

T6. Where did you END the trip (please clarify street name and number or adjacent street) _____
T6.1 If T6 = 7 or 8 or 9 How many kids you were accompanied by? / _____/ (Indicate)

T7 What was the total duration of this trip (note in min) / _____/ (Indicate)

T8. Which modes of transport did you use for this trip (**Interviewer:** select all used, including walking only if more than 500 meters)? Answer using the provided codes (see Table C2)

T9. For each mode of transport used, please indicate:

T9.1. What time did you need from your starting point before you take your transport mode (time to the bus stop/metro station/parking/interchange + including waiting time)

T9.2 What time did you need from the bus stop/metro station/parking to your destination? (**Scripter:** questions T9.1 and T9.2 are asked to everyone except those who answered 1 –walking – on T8).(**Scripter/Interviewer:** if the respondent used more than one mode of transport during a single trip, question T9.2 is asked only about the last mode of transport used).

T9.3 Duration you have ride this mode/walk (**in minutes**)

T9.4 For public transport, please, indicate the cost for the trip (GEL) (**Scripter:** question T9.4 is asked only to those who answered 6, 7, or 11–21 on T8).

	8. Mode used (use codes in Table C2)	9.1 Access time (to mode) - except #1 in C2 – walking)	9.2 Egress time (except #1 in C2 – walking)	9.3 Duration you've ridden this mode/ walked	For T8 = 6-7 or from 11 to 21: 9.4 Cost of trip (only for public transport)
mode of transport used					<i>(write the cost)</i> 77. I use public transport for free. 88. I use MetroMani subscription/package.
mode of transport used					
mode of transport used					
mode of transport used					
mode of transport used					

T10. (If T8= 8 to 14) When you used a car, how many people were in the car, including yourself and the driver? _____ (**Indicate**)

T11. (If T8=8) If you used a car and you accessed a paid parking, how much did you pay for the parking? _____ (**Indicate**)

88. I have not used paid parking

77. I have not paid anything because I have purchased a parking permit

Scripter: ask the questions from Section #4 (“Personal Trips”) to the respondent regarding all trips made on the previous day. After person ends with their trips – go to next member of household to continue with Part 3&4.

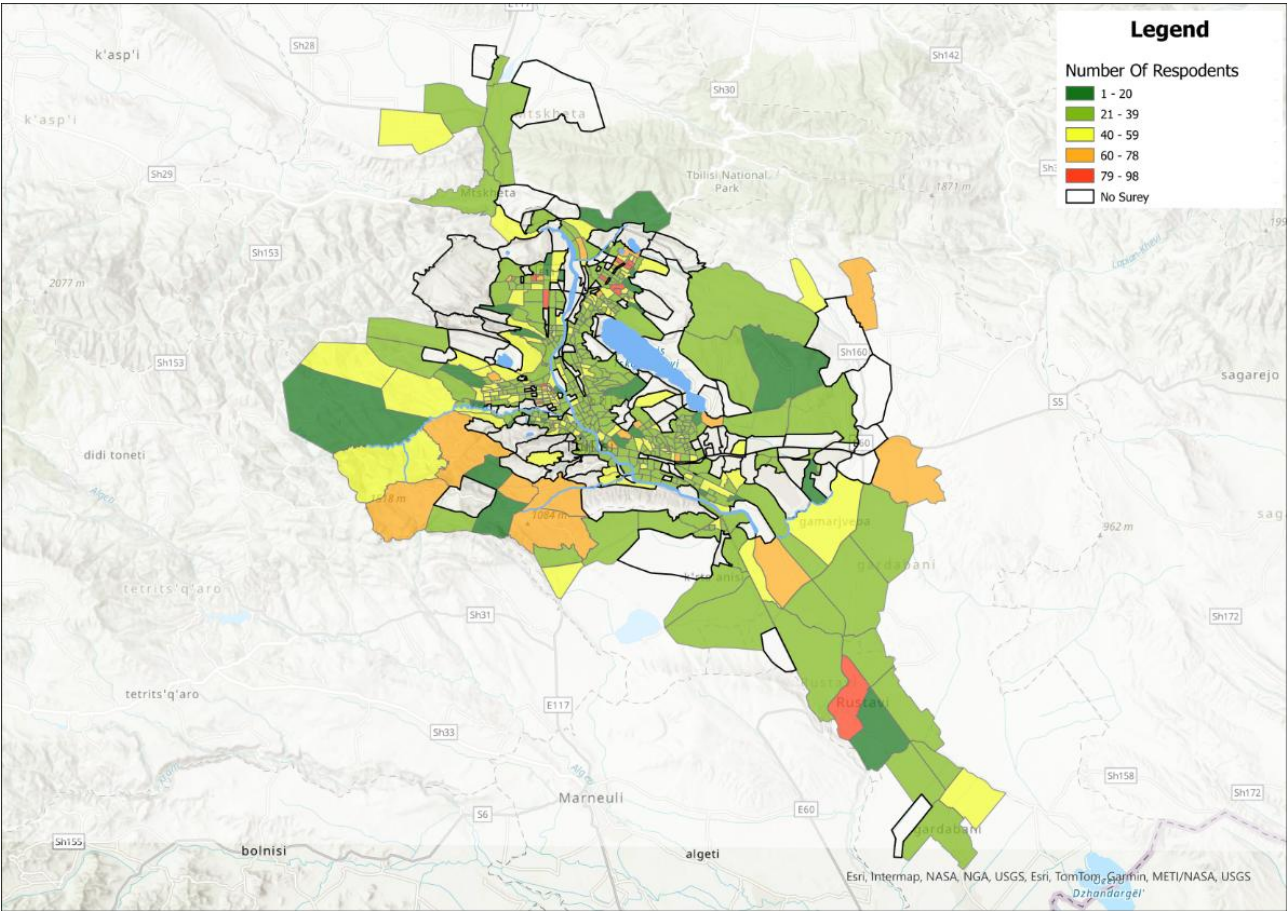
Table C1: CODES REASON OF TRIP (START OR END POINT OF TRIPS)

1. Domicile
2. Usual workplace
3. Not usual workplace/ on some work tasks
4. Secondary School
5. University
6. Courses/clubs/sections/other educational facilities
7. Accompanying/picking kids to/from nursery, kindergarten
8. Accompanying/picking kids to/from school
9. Accompanying/picking kids to/from courses/clubs/sections etc
10. Big shopping (in shopping malls / supermarkets / big markets / bazar)
11. Daily needs shopping (in small nearby stores, on street markets etc)
12. Health center/Doctor
13. Services and administrative needs (city service centers, banks, etc)
14. Sport and body-care activities
15. Cultural site (cinema, theaters, concert hall)
16. Restaurant, café or other socializing sites
17. Visiting home of other people (parents, relatives, friends etc)
18. Having a promenade around the city, in park etc (in this case in address question – state address of start of promenade/entrance to park)
19. Car service (service centres, fuel stations, carwash etc)
20. Other (specify) _____

Table C2: CODES FOR MODE OF TRANSPORT

- | | |
|--|--|
| 1. Walking | 13. Taxi passenger |
| 2. Bicycle (personal) | 14. Ridehail passenger (services like Uber, Bolt, YandexTaxi etc.) |
| 3. Two wheels personal motor vehicle (motorcycle, moped etc.) | 15. Metro |
| 4. Personal e-scooter (or another motorized light personal vehicle) | 16. Bus (local bus) |
| 5. Scooters/skateboard (or another non-motorized light personal vehicle) | 17. Marshrutka (local) |
| 6. Rented/shared bicycle | 18. Cable car |
| 7. Rented/shared e-scooter | 19. Intercity train |
| 8. Car as driver | 20. Intercity bus |
| 9. Car as passenger | 21. Intercity marshrutka (regional and long-distance) |
| 10. Car pickup (poputka) | 22. Shared transport provided by employer (shuttle, bus...) |
| 11. Rented car (as driver) | 23. Pupil/student transport (like schoolbus) |
| 12. Rented car (as passenger) | 24. Truck, lorry |
| | 25. Any other |

Annex #2 – Distribution of Interviews in Microzones



Annex #3 – Survey database (separate annex)

Annex #4 - Comparison Analysis with 2016 HHS

Asian Development Bank

NPLE Tbilisi Development Fund

MODAL SPLIT COMPARISON

Data Collection and Model Update Related to Transport in Tbilisi

LCIP/C/QCBS/09-2023



OBJECT

- Analyzing aspects of the 2016 and 2025 surveys methodology that could have influenced the outcomes of each survey
- Analyzing key aspects that could have influenced the travel habits of (interviewed) people in Tbilisi
- Defining possible reasons to justify the observed differences between outcomes of the 2016HHS and of the 2025HHS, especially concerning the modal split

DIFFERENCES IN THE SURVEY APPROACH - 2016 vs 2025

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Quantitative Survey
Quantitative Survey



Face to Face interview
Face to Face interview



Pre-defined micro zones
Pre-defined micro zones



Random Sampling
Random Sampling



6,116 households
10,023 households



April 2016 – June 2016
November 2024 – May 2025



Walking trips > 200 meters
Walking trips > 500 meters



Population of Tbilisi 5+
Population of Tbilisi 14+

HOUSEHOLD SURVEY WERE CONDUCTED DEPLOYING QUANTITATIVE SURVEY APPROACH – FACE TO FACE INTERVIEWS

MOST LIKELY IMPACT OF SURVEY APPROACH ON WALKING



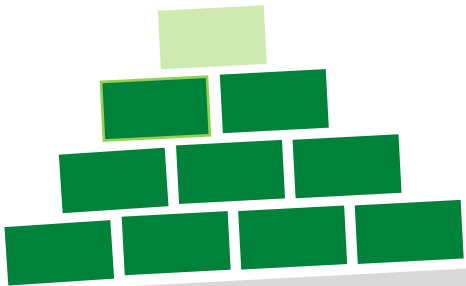
- Recording walking trips of 500 meters (2025) instead of trips of 200/250 meters (2016)



- Conducting interviews in winter-spring (2025) instead of spring period (2016)



- Interviewing of 14+ (2025) instead of 5+ (2016)



REDUCING "Walking" in 2025

INCREASING "Walking" in 2025

SHORT TRIPS ARE MADE BY WALKING: IN 2016 MANY MORE "SHORT TRIPS" WERE RECORDED AND IT DETERMINED A HIGHER MODE SHARE FOR "WALKING"

THE AGE BAND 5 TO 14 USES MORE "WALKING" AND SPRING-TIME SURVEY ALSO FAVOURS "WALKING"

IMPACT OF APPROACH ALIGNMENT ON WALKING

2016 APPROACH: 5+ people and >200m. legs

MODE	MODES FOR ANY TRIP LEG		MAIN MODE OF ANY TRIP		MODE	MODES FOR ANY TRIP LEG		MAIN MODE OF ANY TRIP	
	N° TRIPS	%	N° TRIPS	%		N° TRIPS	%	N° TRIPS	%
Walk	16.924	42,36%	7.540	26,66%	Walk	13.167	38,22%	4.340	18,54%
Public Transport	13.159	32,93%	10.920	38,60%	Public Transport	12.311	35,74%	10.149	43,34%
Car Driver	5.535	13,85%	5.516	19,50%	Car Driver	5.528	16,05%	5.509	23,53%
Car Passenger	3.121	7,81%	3.058	10,81%	Car Passenger	2.378	6,90%	2.315	9,89%
Taxi Passenger	898	2,25%	850	3,00%	Taxi Passenger	839	2,44%	793	3,39%
Bicycle	53	0,13%	38	0,13%	Bicycle	51	0,15%	37	0,16%
Combined	0	0,00%	132	0,47%	Combined	0	0,00%	130	0,56%
Two wheels motor veh	36	0,09%	28	0,10%	Two wheels motor veh	33	0,10%	25	0,11%
Other	231	0,58%	205	0,72%	Other	143	0,42%	117	0,50%
TOTAL	39.957		28.287			34.450		23.415	

2016 APPROACH

2025 APPROACH

NOT CONSIDERING SHORT LEGS OF TRIPS AND TRIPS OF 5 TO 14 YEARS PEOPLE HAS A CLEAR IMPACT ON “WALKING” SHARE
 EVEN IF CONSIDERING ALL LEGS OF ALL TRIPS, THE “WALKING” SHARE DECREASES TO 38,22%
 IF CONSIDERING ONLY THE “MAIN MODE” OF EACH TRIP, THE “WALKING” SHARE DECREASES TO 18,54%

MOST LIKELY IMPACT OF SURVEY APPROACH ON PT USE

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- Interviewing of 14+ (2025) instead of 5+ (2016)



REDUCING “PT USE” in 2025

INCREASING “PT USE” in 2025

WE CAN ASSUME THAT PEOPLE 12+ USE PT ONLY NOT ACCOMPANIED BY ADULTS.

HAVING INTERVIEWED ONLY 14+ IN 2025 REDUCED THE OVERALL NUMBER OF TRIPS (THOSE MADE BY PEOPLE FROM 5 TO 14) AND INCREASED THE NUMBER OF TRIPS MADE WITH PT BY “NOT ACCOMPANIED PEOPLE” (12+)

IMPACT OF APPROACH ALIGNMENT ON PT USE

MODE	MODES FOR ANY TRIP LEG		MAIN MODE OF ANY TRIP		MODE	MODES FOR ANY TRIP LEG		MAIN MODE OF ANY TRIP	
	N° TRIPS	%	N° TRIPS	%		N° TRIPS	%	N° TRIPS	%
Walk	16.924	42,36%	7.540	26,66%	Walk	13.167	38,22%	4.340	18,54%
Public Transport	13.159	32,93%	10.920	38,60%	Public Transport	12.311	35,74%	10.149	43,34%
Car Driver	5.535	13,85%	5.516	19,50%	Car Driver	5.528	16,05%	5.509	23,53%
Car Passenger	3.121	7,81%	3.058	10,81%	Car Passenger	2.378	6,90%	2.315	9,89%
Taxi Passenger	898	2,25%	850	3,00%	Taxi Passenger	839	2,44%	793	3,39%
Bicycle	53	0,13%	38	0,13%	Bicycle	51	0,15%	37	0,16%
Combined	0	0,00%	132	0,47%	Combined	0	0,00%	130	0,56%
Two wheels motor veh	36	0,09%	28	0,10%	Two wheels motor veh	33	0,10%	25	0,11%
Other	231	0,58%	205	0,72%	Other	143	0,42%	117	0,50%
TOTAL	39.957		28.287			34.450		23.415	

2016 APPROACH

2025 APPROACH

REDUCING THE NUMBER OF “WALKING LEGS OF ALL TRIPS”, THE SHARE OF PUBLIC TRANSPORT TRIPS INCREASES 35,74%
IF CONSIDERING ONLY THE “MAIN MODE” OF ANY TRIP, THE SHARE OF PUBLIC TRANSPORT TRIPS INCREASES TO 43,34%

ESTIMATING TRIPS - 2016 vs 2025

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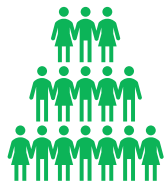
"1,108,717 inhabitants"
(Source: Population General Census of 2014)



1,56 trips
per
person



1,729,599 trips



"1,260,000 inhabitants"
(Source: Population General Census of 2024)



1,35 trips
per
person



1,701,000 trips

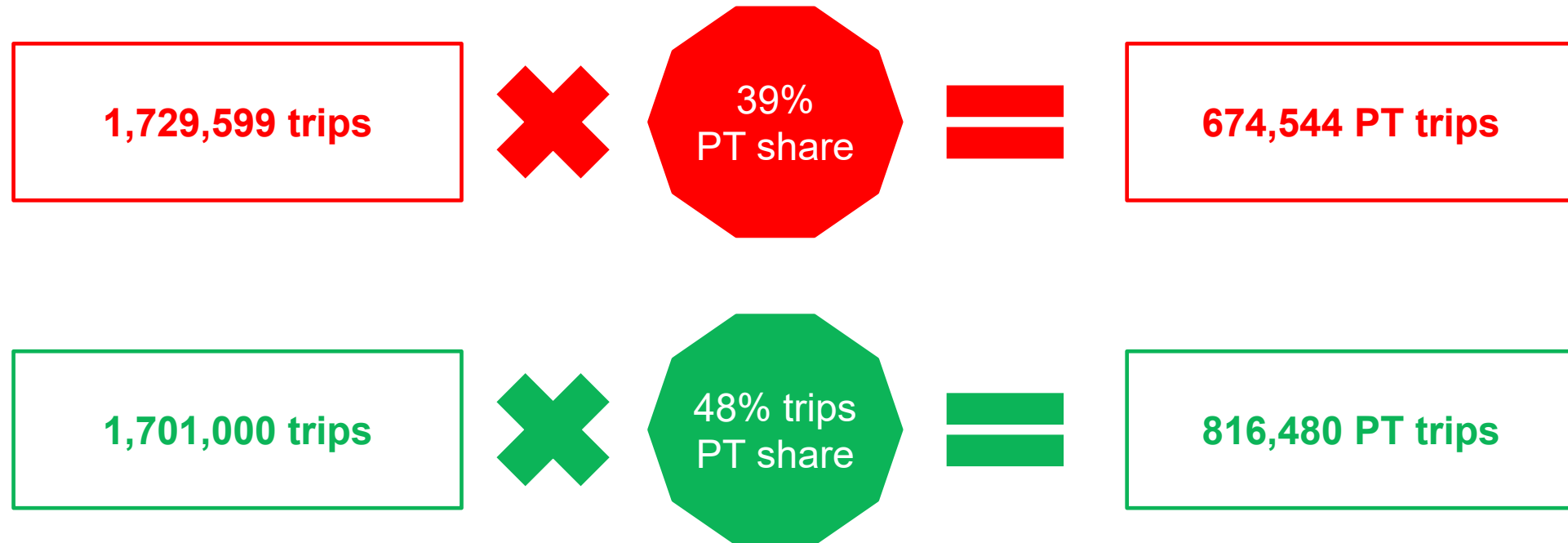
BASED ON THE 2016 HHS ABOUT 1,73 MILLION TRIPS ARE ESTIMATED

BASED ON THE 2025 HHS ABOUT 1,70 MILLION TRIPS ARE ESTIMATED

ESTIMATING PUBLIC TRANSPORT TRIPS - 2016 vs 2025

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BASED ON THE 2016 HHS ABOUT 674.500 PT TRIPS ARE ESTIMATED

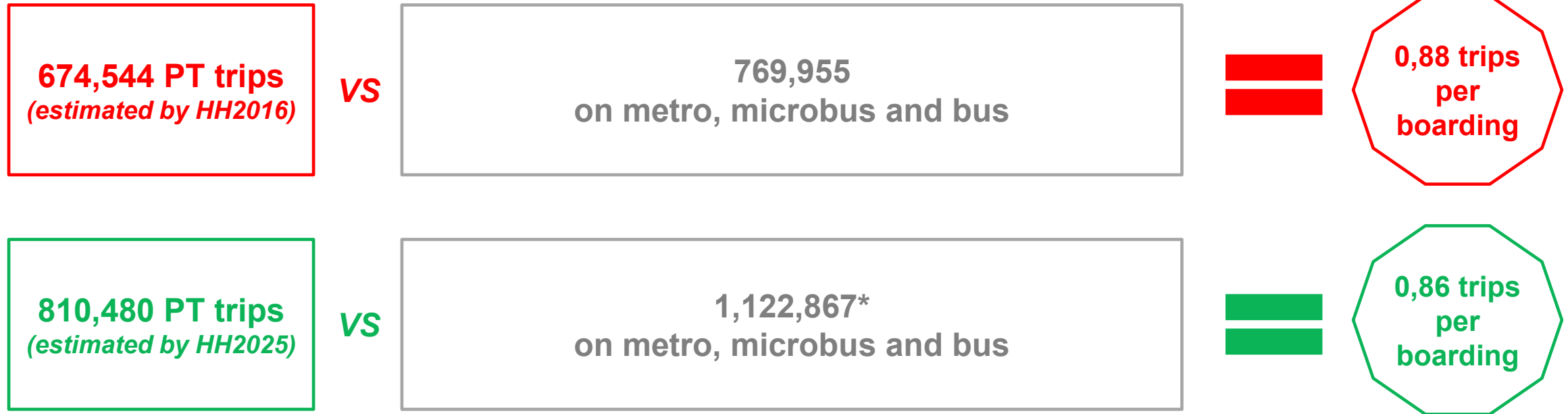
BASED ON THE 2025 HHS ABOUT 810,000 PT TRIPS ARE ESTIMATED

ESTIMATED PT TRIPS VS OBSERVED BOARDING - 2016 vs 2025

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OBSERVED BOARDINGS ON AVERAGE WEEKDAYS



* Source: data received from the Client

BASED ON THE 2016 HHS ABOUT 0,88 PT TRIPS PER BOARDING ARE ESTIMATED

BASED ON THE 2025 HHS ABOUT 0,86 PT TRIPS PER BOARDING ARE ESTIMATED

SIMPLIFIED* ANALYSIS OF HHS2025 MODAL SPLIT 2025

*This specific analysis doesn't consider the expansion coefficients used for the provided elaborations

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A - MODES OF TRANSPORT FOR EACH LEG OF EACH TRIP (NOT EXPANDED)		
Mode of transport	Tot.	%
Car as driver	5.232	18,06%
Car as passenger	2.062	7,12%
Cable car	4	0,01%
Car pickup (poputka)	10	0,03%
Rented car (as driver)	60	0,21%
Taxi passenger	318	1,10%
Ridehail passenger (services like Uber, Bolt, YandexTaxi etc.)	379	1,31%
Truck, lorry	14	0,05%
Two wheels personal motor vehicle (motorcycle, moped etc.)	94	0,32%
Scoters/skateboard (or another non-motorized light personal vehicle)	7	0,02%
Personal e-scooter (or another motorized light personal vehicle)	17	0,06%
Shared transport provided by employer (shuttle, bus...)	139	0,48%
Rented/shared bicycle	4	0,01%
Metro	4.212	14,54%
Bus (local bus)	9.186	31,70%
Marshrutka (local)	3.250	11,22%
Intercity bus	13,04%	
Intercity marshrutka (regional and long-distance)		
Intercity train		
Pupil/student transport (like schoolbus)		
Bicycle (personal)		
Walking	3.777	13,04%
	28.974	100%

B - MODES OF TRANSPORT FOR FIRST LEGS OF EACH TRIP (NOT EXPANDED)		
Mode of transport	Tot.	%
Car as driver	5.211	22,5%
Car as passenger	1.997	8,6%
Cable car	2	0,0%
Car pickup (poputka)	10	0,0%
Rented car (as driver)	59	0,3%
Taxi passenger	292	1,3%
Ridehail passenger (services like Uber, Bolt, YandexTaxi etc.)	362	1,6%
Truck, lorry	13	0,1%
Two wheels personal motor vehicle (motorcycle, moped etc.)	93	0,4%
Scoters/skateboard (or another non-motorized light personal vehicle)	5	0,0%
Personal e-scooter (or another motorized light personal vehicle)	17	0,1%
Shared transport provided by employer (shuttle, bus...)	129	0,6%
Rented/shared bicycle	4	0,0%
Metro	2.271	9,8%
Bus (local bus)	7.002	30,2%
Marshrutka (local)	2.240	9,7%
Intercity bus	33	0,1%
Intercity marshrutka (regional and long-distance)	57	0,2%
Intercity train	4	0,0%
Pupil/student transport (like schoolbus)	42	0,2%
Bicycle (personal)	23	0,1%
Walking	3.333	14,4%
	23.199	100%

B WITH ADDITIONAL WALKING LEGS TO ACCESS 50% OF PT WHEN FIRST LEG		
Mode of transport	Tot.	%
Car as driver	5.211	18,0%
Car as passenger	1.997	6,9%
Cable car	2	0,0%
Car pickup (poputka)	10	0,0%
Rented car (as driver)	59	0,2%
Taxi passenger	292	1,0%
Ridehail passenger (services like Uber, Bolt, YandexTaxi etc.)	362	1,2%
Truck, lorry	13	0,0%
Two wheels personal motor vehicle (motorcycle, moped etc.)	93	0,3%
Scoters/skateboard (or another non-motorized light personal vehicle)	5	0,0%
Personal e-scooter (or another motorized light personal vehicle)	17	0,1%
Shared transport provided by employer (shuttle, bus...)	129	0,4%
Rented/shared bicycle	4	0,0%
Metro	2.271	7,8%
Bus (local bus)	7.002	24,1%
Marshrutka (local)	2.240	7,7%
Intercity bus		
Intercity marshrutka (regional and long-distance)		
Intercity train		
Pupil/student transport (like schoolbus)		
Bicycle (personal)		
Walking	9.137	31,5%
	29.003	100%

ALL MODES USED FOR ANY LEG OF ANY TRIP GENERATES A LOW RATIO FOR WALKING
 LIMITING THIS ANALYSIS TO THE FIRST LEG OF ANY TRIP HIGHLIGHTS A QUITE HIGH NUMBER OF "PT TRANSPORT" WITHOUT WALKING
 TO THE STOPS BEFORE STARTING THE JOURNEY
 ADDING A "WALKING LEG" (TO THE STOP) FOR EVEN ONLY FOR 50% OF THESE TRIPS, WOULD INCREASE THE WALKING RATIO TO 31,5%

SUMMARY

- ❑ Aligning the methodological approach reduces the differences in “Walking”:
 - If considering all legs, “Walking” in 2016 lowers from 42,36% to 38,22%
 - If considering only the main mode of each trip, “Walking” in 2016 lowers from 26,66% to **18,54%**
- ❑ Aligning the methodological approach reduces the differences in “PT USE”:
 - If considering all legs, “Walking” in 2016 lowers from 32,93% to 35,74%
 - If considering only the main mode of each trip, “PT share” in 2016 increases from 38,60% to **43,34%**
- ❑ When comparing the modal split of Public Transport, it is important to note that:
 - Between 2016 and 2025, the number of boardings on buses, minibuses and metro **increased 46%**
 - Between HHS2016 and HHS2025, the PT share **increased about 27% (38,5 vs 49%)**
 - **The ratio “HHS estimated PT trips” vs “Observed boardings” dropped from 0,88 to 0,86 between 2016 and 2025:** this value is almost similar for the two surveys, further validating the results of HHS.
 - Adding a “walking feeder leg” to PT stops to even only 50% of recorded trips that start with PT, **increases the walking share to 31,5% that is higher than HHS2016.** Adding the “walking feeder leg” is reasonable, assuming that 50% of population doesn’t live less than 250 meters from a bus stop

- **ALIGNING THE APPROACH TO THE SURVEY, MAKES WALKING RATIO IN 2016 AND 2025 SIMILAR; NO DIFFERENCES IN WALKING RATIO IF ADDING “WALKING TO A PT STOP” TO 50% OF 2025 TRIPS STARTING WITH PT PT SHARE INCREASED 27% BETWEEN 2016 AND 2025, AND THIS IS MUCH LOWER THAN THE OBSERVED INCREASE OF PT BOARDINGS (+46%)**

ADVISORY

TECHNICAL ASSISTANCE

MONITORING & EVALUATION

LEARNING

COMMUNICATION

DIGITAL LAB

SAFETY QUALITY ENVIRONMENT

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