HARMONY

SPATIAL & TRANSPORT PLANNING FOR A NEW MOBILITY ERA

The 3rd Cross Metropolitan Workshop

Moderator: Vicent Pastor
Head Of Corporate Development / Chief Innovation Officer at ENIDE

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815269

Part of: 2020 CIVITAS

Harmony MS

AGENDA

•13.35h - 13.40h (5 min): *HARMONY overview* by Vicent Pastor (Head Of Corporate Development / Chief Innovation Officer at ENIDE)

• 13.40h - 13.50h (10 min): *Use Case -the Rotterdam, eTrikala, Katowice experience in Harmony* by Jos Streng (Transport Planner, Urban Development City of Rotterdam), Elena Patatouka (Senior Project Manager at e-trikala)

• 13.50h - 14.00h (10 min) *The results of the stakeholder engagement activities in HARMONY* by TARIQ van Rooijen (Senior Project ManagerSenior Project Manager TNO)

• 14.00h - 14.15h (15 min): *Policy recommendations for SUMPs* by Vanessa Holve (Policy and Project Advisor at TRT TRASPORTI E TERRITORIO SRL)

•14.15h - 14.25h (10 min): *MOBY data collection with the results obtained in TURIN* by Vanessa Holve (Policy and Project Advisor at TRT TRASPORTI E TERRITORIO SRL)

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Harmony MS

HARMONY
SPATIAL & TRANSPORT PLANNING FOR A NEW MOBILITY ERA

HARMONY OVERVIEW
Duration: 5 min

Speaker: Vicent Pastor

Contact: jvicent.pastor@enide.com

HARMONY OVERVIEW

Harmony consortium

20 partners from 9 European countries

UCL, TRT, aimsun., City of Rotterdam, TU Delft, enide, significance, Oxfordshire County Council, AIRBUS, Città di Torino, moby, transport for athens, University of Wolverhampton, TNO, e-trikala, Torino Urban Lab, GRIFF, Metropolis GZM

Budget: 7,649,645.25 Euro - Duration: 06/2019 – 03/2023

HARMONY OVERVIEW

Consortium: 20 members from 12 countries **Project Coordinator:** UCL **Project duration:** June 2019 (M1) – March 2023 (M45)

Enable metropolitan area authorities to lead the transition to low-carbon mobility through new spatial and transport planning tools.

Main outcomes

Harmony Model Suite

A platform bringing together transport and spatial planning tools, people and freight activity-based models, network models and land-use models.

Training material and activities

Authorities and transport professionals will develop skills and knowledge to use the model suite tools.

Best practices for SUMPs

The best practices for SUMPs will provide authorities with evidence-based recommendations to update their Sustainable Urban Mobility Plans, including autonomous vehicles and drones.

MobyX: Data Collection Tools

A free smartphone application, MobyApp, was developed for Android and iOS. A travel diary is composed of real data, collected through the smartphone's GPS.

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HARMONY OVERVIEW

HARMONY MS and Moby X - Where are they applied?

Harmony Model Suite

Applied in Turin and Oxfordshire

MobyX: Data Collection Tools

Applied in Turin, Oxfordshire, Rotterdam, and Athens

HARMONY OVERVIEW

HARMONY's AV and Drones demonstrations

- **Oxfordshire County (UK):**
  - **Drones for freight**
- **Rotterdam (NL):**
  - **Last mile delivery robot**
- **Trikala (GR):**
  - **UAV for pharmaceutical purposes**

Use Case -
the Rotterdam, eTrikala, experience in Harmony
Duration: 10 min

Speaker: Jos Streng,
The City Of Rotterdam

Contact: jma.streng@rotterdam.nl

Speaker: Dr Elena Patatouka,
E-Trikala

Contact: elpatatouka@e-trikala.gr

HARMONY Use Case -Rotterdam

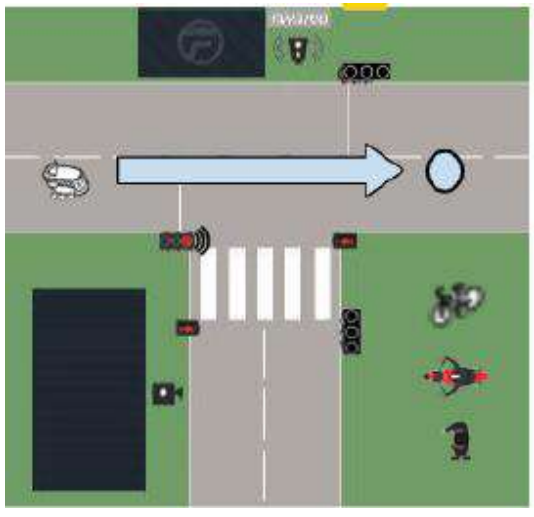
- Reasons for participating:
  1) increasing quality of instruments to develop, analyse and evaluate urban freight traffic policy in the new era – simulator development and application, data collection
  2) gaining practical insight in the potential role for AV in urban last mile delivery

HARMONY Use Case -Rotterdam

- Outcomes:
  1) application of the urban freight simulator for use cases at the strategic level and the operational level (tentative)
  a) introduction of ZECL zone b) substituting vans by cargobikes

  2) original plan of trial with an automated van on public road for urban last mile delivery had to be canceled. A scaled down test has been organised with a delivery robot, which is being completed this week. A short test on public road was part of the test.

HARMONY Use Case -Rotterdam



HARMONY Use Case -Rotterdam

- Future plans:
  1) extension and improvement of the tactical freight simulator
  2) further development of the operational freight simulator
  3) embedding the responsibility for maintenance of the simulators and building the capacity for using them
  4) application in use cases (and assimilating results from targeted data collection):
  - potential efficiency gain by combined collection of domestic waste and commercial waste
  - quantifying the load on the cycling infrastructure if all suitable vans are substituted by cargo bikes
  - quantifying the potential effect of packet lockers (microhubs)
  - comparing the situation of urban development projects with maximum of logistic space in private domain vs maximum in public space
- Further exploration the interest of logistic operators in automated vehicles for urban last mile delivery (surveys and interviews with Logistiek010 community members)

HARMONY Use Case -the eTrikala

Pilot objectives:

•Explore through a drone demonstration the potential role for drones in urban last mile delivery in the medical sector
•Provide improved mobility systems and services to elder and vulnerable groups that live in rural areas that remain underserved in terms of last mile deliveries
•Reduce traffic congestion within the city centre as well as the car's dominance in the modal split by providing better public connection to the surrounding and rural areas.
•Releasing the SUMP based on HARMONY results and integrating the urban air mobility aspect into urban freight traffic policy
•Increase safety in freight transportation and promote social distancing solutions for improved crisis management.
•Limit the environmental and economic impact of traditional mobility fossil fuel on-ground solutions.
•Help transforming the idea/concept of HARMONY to a business idea: the transformation of the pilot to a permanent service for the citizens with a viable business and financial plan.
•Expand and maintain digital infrastructure in the 3rd dimension in the private sector and in public transportation.
•Develop an urban air mobility ecosystem that enables new jobs, tests and investments from the local to the regional and the national.
•Disseminate the solution in other local ecosystems in cities in the Greek and the European context.

HARMONY Use Case -the eTrikala

Pilot objectives:

- Drones demonstration - Freight: carrying medicines from the city to surrounding villages

Final Case study focusing on a pharmacy logistic center that delivers medicines to pharmacy shops where there are increased current needs of elderly groups through ground mobility modes

User Acceptance surveys to stakeholders (before & after the demo)

User Acceptance survey to citizens

Co-create together with a range of stakeholders for a coherent collaborative solution to enable progress

The results of the stakeholder engagement activities in HARMONY
Duration: 10 min

Speaker: TARIQ van Rooijen
Contact: tariq.vanrooijen@tno.nl

Validation areas: orchestration, engagement, and demonstrations

Focus on organising all the activities that take place in the six HARMONY metropolitan areas.

Co-creation labs in all the six Harmony metropolitan areas:

- Rotterdam, Oxfordshire, Turin, Athens, Trikala, Katowice

Demonstrations:

- Rotterdam (Delivery robot freight demo)
- Oxfordshire (Electric van and drone demo)
- Trikala (Drone demo)

High-level activities

- Co-creation to support modelling activities and implementation of innovative technologies.
- Covid restrictions were a severe barrier for co-creation
- Implementing innovation technologies is difficult. Should provide input to the models.
- Order of activities in project changed.
- A process evaluation has been set-up to capture changes, the drivers and barriers, key stakeholder engagement moments, success factors, lessons learnt.
- A small scale impact evaluation will also take place.

Oxfordshire co-creation lab

Main objective

To contribute to the demonstration of urban air mobility solutions in UK and use Harmony modelling activities to further contribute to the development of the regional spatial and transport planning strategies.

- ✓Integrate Harmony project recommendations on new urban air mobility technologies into the regional spatial and transport planning strategies.
- ✓Carry out drone demonstration and evaluate the feasibility and viability of this urban mobility solution.

Oxfordshire activities

Two workshops took place about modelling: to explain the capabilities of the HARMONY MS.

Data collection through Travel Diaries (April – July 2022): 90 users, 900 verified trips

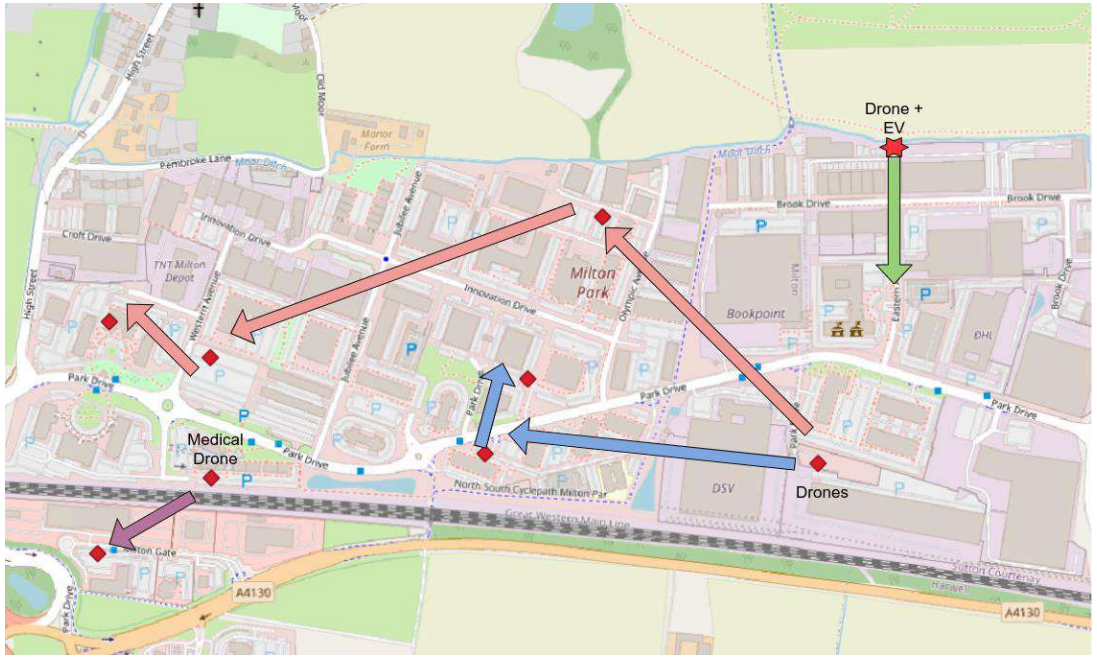
Pilot (August 2022): an electric freight van in combination with UAV

Demonstration.

- AIRBUS: interface between the Airbus UTM-System and the DJI drones from RUAS
- RUAS: received permission to fly drone over railway line.

Oxfordshire activities

- Use Cases
  - Drone + EV combined trial
  - Parcel + gift delivery
  - Tools delivery
  - Medical equipment delivery



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Athens co-creation lab

Main objective

Apply the HARMONY spatial & multimodal transport planning tool to model new mobility services, measures and policies as well as evaluate and quantify their impacts in the Athens area, aiming at a sustainable and energy-efficient PT system

- ✓Engage and work with stakeholders and citizens through the organization of co-creation labs.
- ✓Apply the Strategic and Tactical simulators of the HARMONY MS on the updated Athens transportation model.
- ✓Simulate the co-created scenarios to quantify their impact.
- ✓Organize workshops to discuss the results and take recommendations to update the short-, medium-, and long-term spatial and transport planning strategy.

Athens Activities

- Co-creation workshops with many partners to define use cases and get input for the modelling. The first workshop was online. The second one will take place soon.
- Three use cases for modelling:
  - Electrification of public transport
  - Operation of autonomous bus fleets
  - Application of micromobility schemes
- Used as input for the SUMP.

Katowice (GZM) co-creation lab

Main objective

To have a citizen-driven approach to the process of SUMP creation, with a focus on the social acceptance of Urban Air Mobility use cases.

- ✓Engage and work with stakeholders and citizens to investigate their requirements in terms of spatial and transport planning and new mobility services.
- ✓Transfer results from the HARMONY MS application to assist the authority to plan for the metropolitan-wide transport, introduce new forms of mobility and update their SUMP.

Katowice (GZM) activities

- A SUMP for GZM has been created, where we search a role for future mobility. Drones are one of the most important points in GZM stategy.
- UAM Workshop with crucial stakeholders has been organised, as an input for broader survey. Topic: “Flying taxis? Drones as a component of modern urban mobility”
- 1001 individual citizens from the metropolitan area took place in the drone delivery survey. Results have been reported for a conference paper “Factors affecting preferences for drone delivery services” (IATBR, 2022).
  - Focus: understanding citizens’ preferences for UAM services.
  - Preliminary results: citizens prefer drone services for medicines deliveries, while they do not prefer drones for surveillance and clothes, illegal items, mail, and organs deliveries. Higher noise, an unregistered drone or an unlicensed operator has negative impact on preferences. Preferred delivery areas: rural or villages.

Conclusions & next steps

- All activities in the cities were hindered by COVID.
- Co-creation activities vary in format. Provided mainly input to modelling activities of the project.
- Pilots differ from initial planned pilots but are still innovative.

- Results of pilots are being collected and will be processed
- Final evaluation deliverables will be prepared Q1 2023.

Policy recommendations for SUMPs an SULP
Duration: 15 min

Speaker: Vanessa Holve

Contact: holve@trt.it

As mentioned in the core SUMP Guidelines…

- *a transport model can be used to **generate reliable and consistent input to the SUMP process**, specifically in certain planning stages such as scenario development, measure appraisal and selection, and monitoring*
- *Modelling results help to **predict the impact of different combinations of policies and measures**, taking into account the complex interactions and potential reinforcing or rebound effects, thereby helping to define the most effective integrated packages*
- *Beyond their use to define the baseline scenario, they also **enable regular monitoring of changes in the transport system** during the implementation phase to assess whether you are on track or if you need to react and adapt your actions*

HARMONY Guidelines on Modelling tools for the new mobility era

Rationale and scope:

- Aimed at providing local planning authorities **guidance on transport modelling applications in their SUMP implementation process**
- A clear, concise and up-to-date guidance document on modelling tools for the urban mobility planner's community is still missing
- The **relevance of models in urban transport planning is increasing**, for instance whenever there is the need of properly estimate impacts and indicators (see GHG emissions) which are relevant in the context of **decarbonisation and climate neutrality**
- Also, **new mobility solutions** (see MaaS, ride hailing, CCAM, UAM etc.) are emerging at an extremely fast pace, and **new tools and methodologies are needed to assess their impacts** in the urban environment

HARMONY Guidelines on Modelling tools for the new mobility era

- Project achievements related to the **development of the Harmony Model Suite and its application to case studies in Rotterdam (NL), Oxfordshire (UK), Turin (IT), Athens (GR)** will be framed in a wider context of available tools, applications and best practices
- Guidelines drafted by the (CIVITAS) Harmony project (within the WP8 (Process assessment, SUMPs recommendations and roadmaps) activities, and it is linked to project deliverable D8.3 (Extended SUMP guidelines for metropolitan areas in the new mobility era)

HARMONY Guidelines on Modelling tools for the new mobility era

- **Introduction**
- **What Transport Models are**
  - A classification of transport models
  - Short glossary of commonly used transport modelling terms
- **What Transport Models can do**
- **Challenges and Limits of Transport Models**
- **Transport Models for SUMPs: If and What**
  - Transport Models vs Alternative Methodologies
  - Choosing among Transport Models
  - Summary: the most appropriate transport model (if any)
- **Developing a Transport Model in Practice**
  - Model design
  - Data collection and elaboration
  - Model implementation
  - Model calibration
  - Model application
- **Roles and Responsibilities when developing a Transport model to support a SUMP**
- **Considering modelling in the SUMP steps**
  - Phase 1: preparation and analysis
  - Phase 2: strategy development
  - Phase 3: measure planning
  - Phase 4: implementation and monitoring


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HARMONY Guidelines on Modelling tools for the new mobility era

- Final guidelines to be delivered **early 2023**
- **Contacts/lead authors:** Simone Bosetti (bosetti@trt.it) and Vanessa Holve (holve@trt.it), TRT
- **Contributing authors:** experts from Harmony project partners (UCL, TNO, University of the Aegean, University of Wolverhampton, Technical University of Delft, Moby X, AIMSUN, ICCS)

MOBY data collection with the results obtained in TURIN
Duration: 10 min

Speaker: Vanessa Holve

Contact: holve@trt.it

HARMONY Project - Overview

Objective

- Develop a new generation of **harmonised spatial and multimodal transport planning tools** to support Metropolitan and Regional Authorities toward a **Sustainable Transition** to a New **Mobility** Era

Results

- **Model Suite (MS):** multi-scale, software-agnostic, integrated model system (mainly based on the activity-based approach).
- **Recommendations for SUMPs update** (new technology and services, modelling tools)

Applications

- Analyse regional and urban interventions for **passenger and freight mobility**
- **Six European metropolitan areas** (Rotterdam(NL), Oxfordshire(UK), Turin(IT), Athens(GR), Trikala(GR), Upper Silesian-Zaglebie Metropolis(PL))

HARMONY Model Suite

STRATEGIC

Regional economic, demographic forecasting, **land-use**, spatial freight and passenger interaction and long-term **mobility choice** models.
Long-term horizon (e.g., year-to-year, every 5 years)

TACTICAL

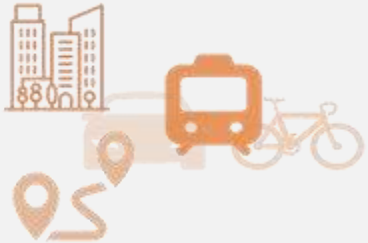
Agent-based passenger and freight demand model, representing passenger and freight agents' choices.
Mid-term horizon (e.g., on a day-to-day level)

OPERATIONAL

Representing the transport supply and demand interactions at high granularity on **transport network**.
Short-term horizon (e.g., second to second, minute to minute)

HARMONY Model Suite - Torino

- **Modelling application:** focus on Turin Functional Urban Area (FUA)



- Developing and integrating different models at **strategic, tactical and operational** level
- Definition and simulation of **future scenarios** to explore the impacts of infrastructural projects, MaaS, remote working and road access restrictions measures

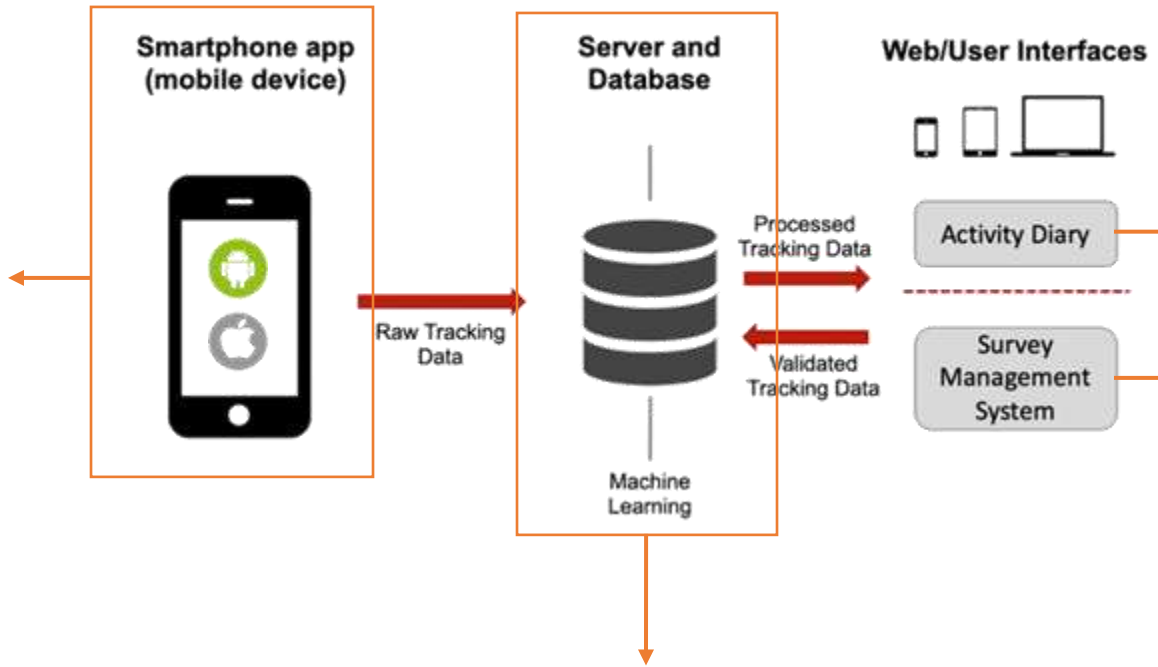
- **Agent based passenger model**
- Collecting required **detailed data** on **individuals and households mobility habits**

- Passenger mobility survey with **MobyApp**, developed to support the modelling application

Survey Integrated Platform

Enabling users to see their **activity/trip diary**

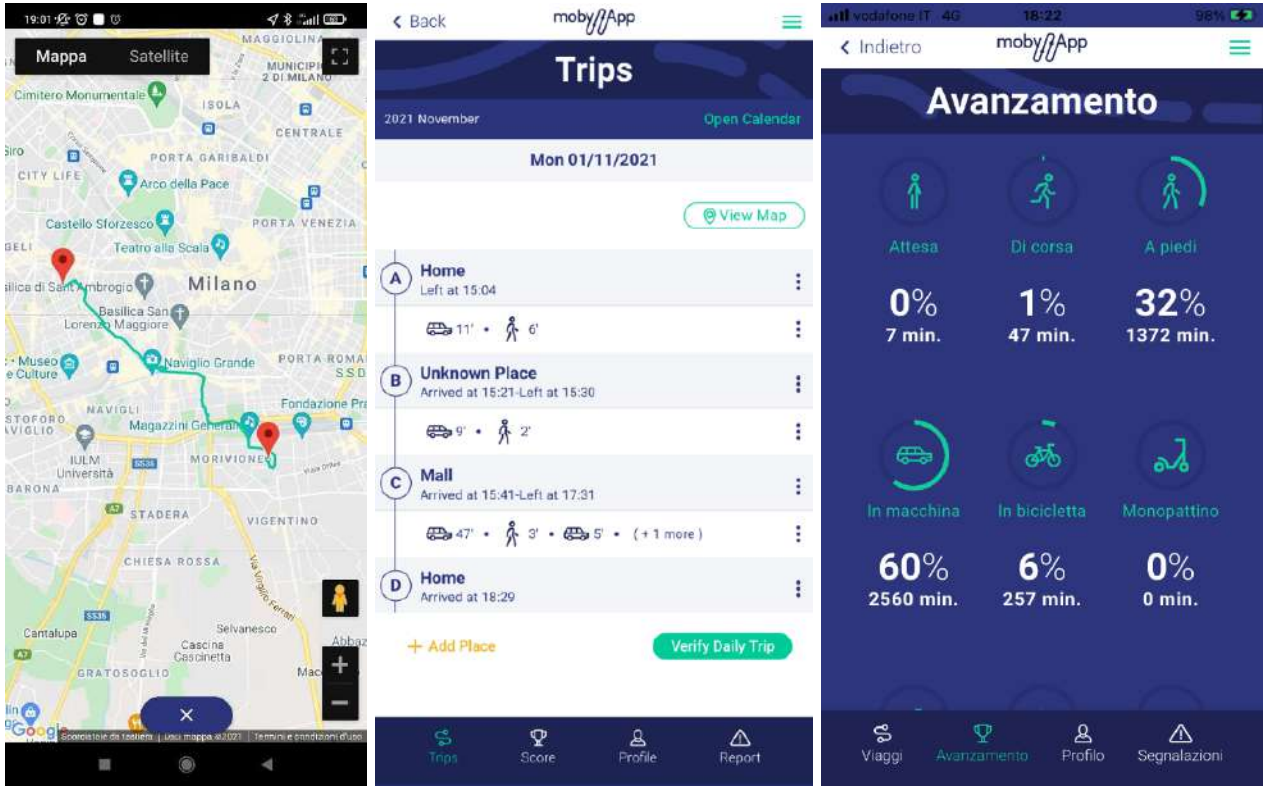
Raw data (GPS, GSM, Wi-Fi and accelerometer)



Help-desk, survey management, questionnaires assignments

Storage and **processing** of collected data

Moby App: how it works



- **Real data** tracked and collected
- Automatic detection of **places**
- Automatic detection of **trips** and **modes** used
- **Manual validation** needed
- **Additional information** asked (e.g.: if the vehicle is shared, parking information, etc.)

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The sample in Turin

- **February 2022**
- **Representative sample** of individuals for the Turin FUA (Functional Urban Area) → 88 municipalities involved
- **Survey company** (IPSOS) engaged for recruitment of individuals

More than **500** **Participants**

55% From Turin municipality	33% From neighbouring municipalities	12% From outlying FUA municipalities	
40% 18 - 34	Years old	60% 35 - 64	
60% Employed	10% Retired	30% Students	
25% No cars	50% One car	25% Two or more cars	

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The sample in Turin

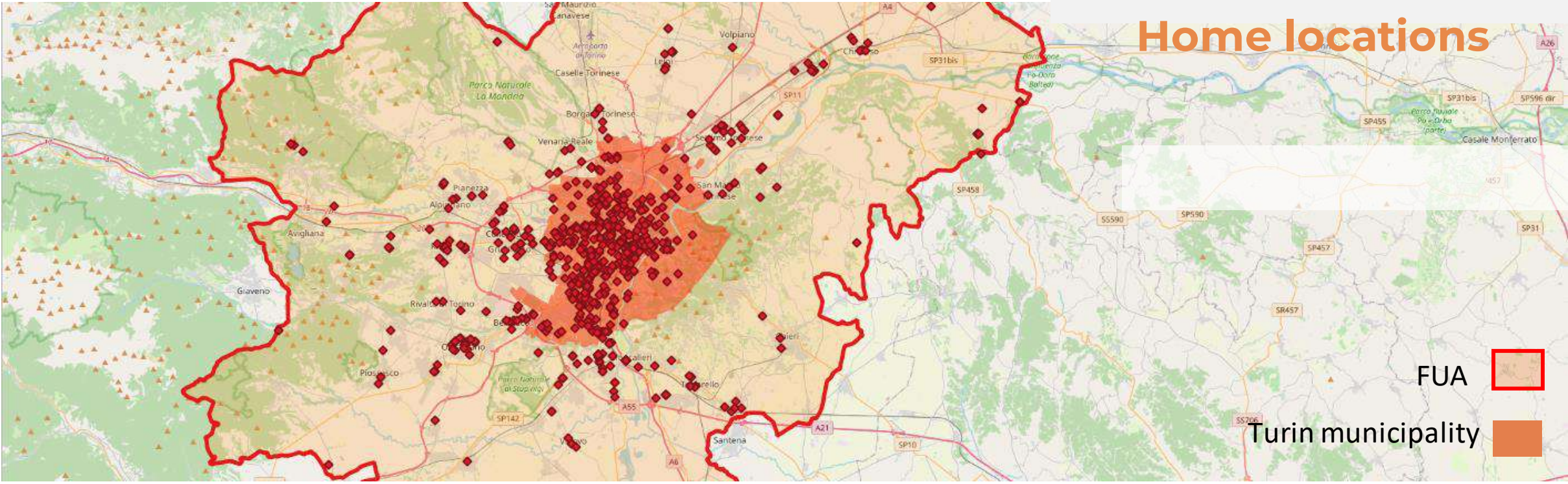
What is asked:

- To fill the **introductory questionnaire**
- To track and validate at least **4 days** of activities and trips
- To fill 2 out of 4 **Stated Preference** questionnaires (Mobility Tool Ownership, Remote Work, Mode Choice, Dynamic Travel Behavior)

10,200 hours of travel data

19,000 trips recorded

Home locations



Preliminary cleaning procedure

MobyApp designed to automatically recognize transport modes

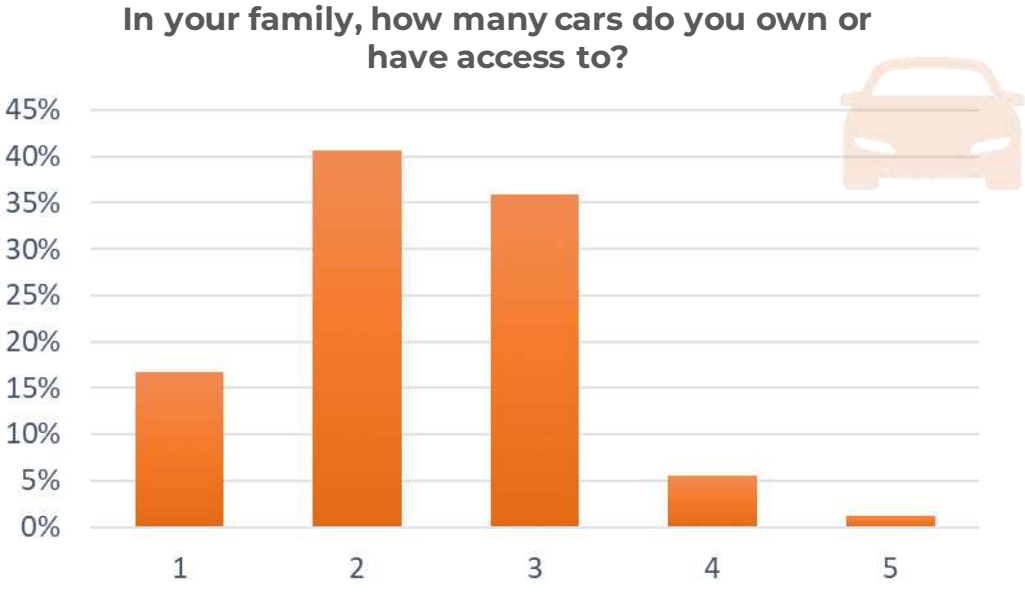
Not all the transport modes are recognizable (e.g.: car vs taxi vs public transport)

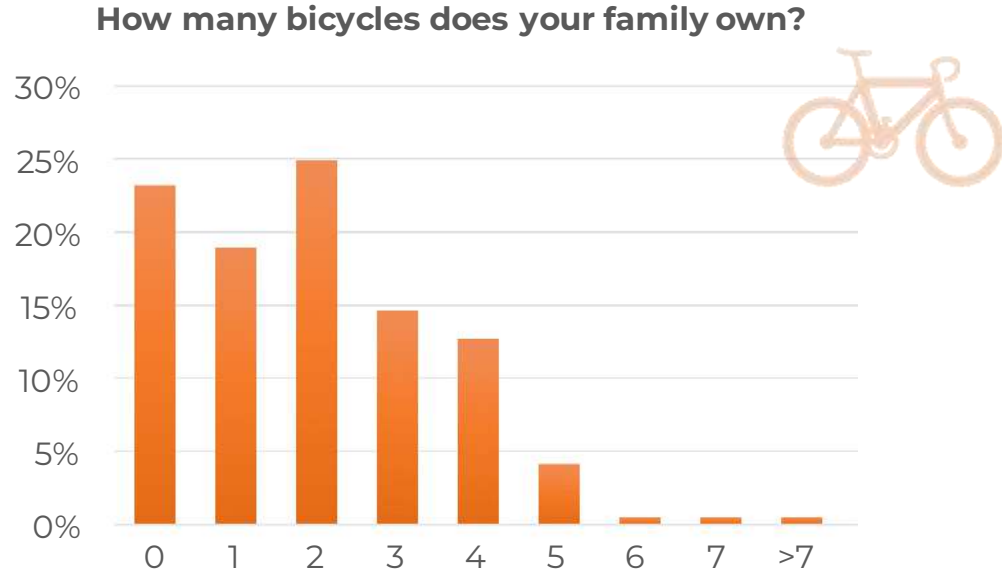
→ Mandatory **validation** of the trips by the users

Data analysis:

- Only **validated trip** were considered
- **Data correction** linking trip data and **introductory questionnaire** answers on mobility habits (cars and PT especially)

Personal mobility





37% Use car many times per day

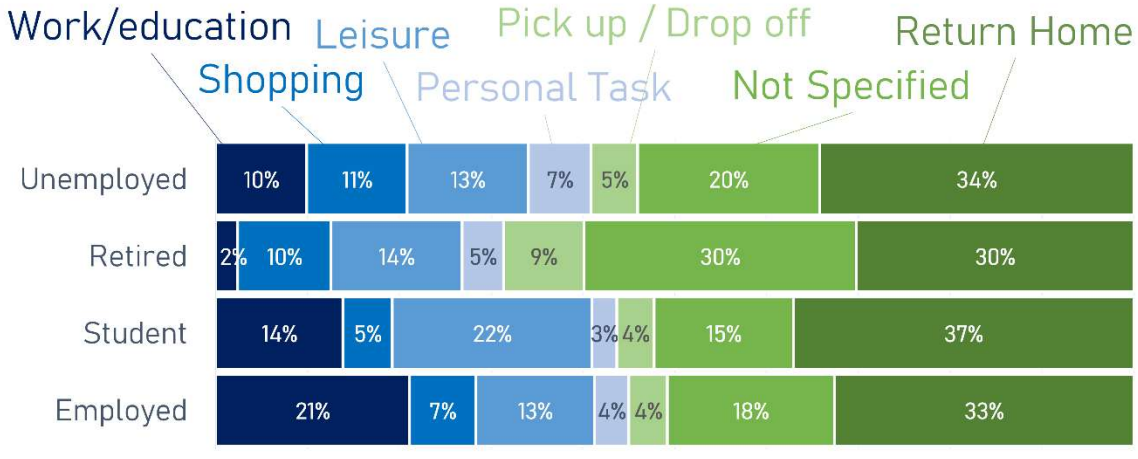
15% Use car less than once every two weeks

22% Own a subscription for metro, tram or bus

5% Own a subscription for rail

Origin and destination activities (purposes)

Destination activities (purposes)



33%
Return to home

31%
Home-based trips

Moby App

3.1
Trips/day (2022)

Validation with IMQ 2013 data shows comparable results

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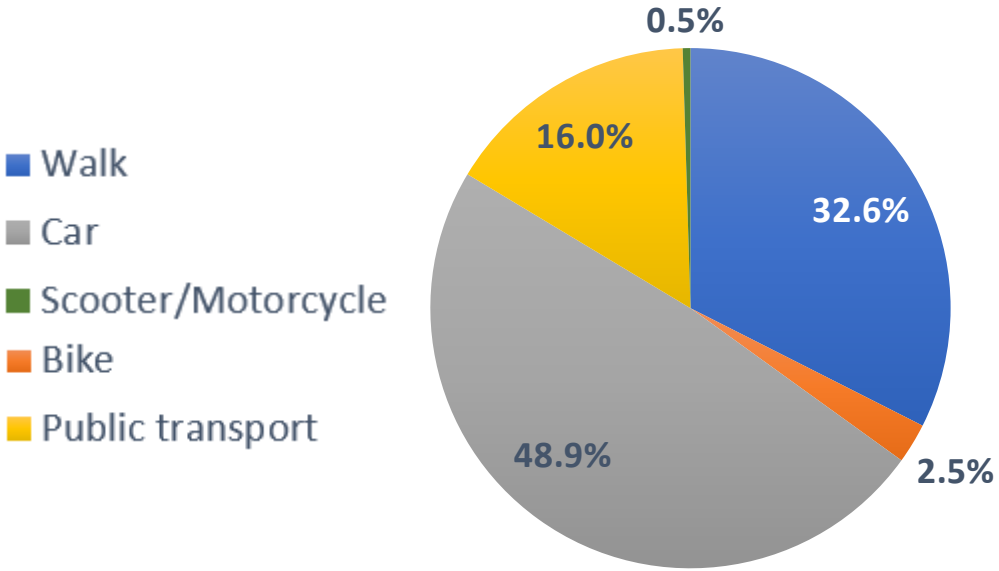
Modal shares in Turin Functional Urban Area

Multi-modal trips:

- MobyApp can collect combinations of **5 modes**
- **Post-processing** to exclude walking and still combinations (e.g.: walk + car)

1.3% **Multi-modal trips**

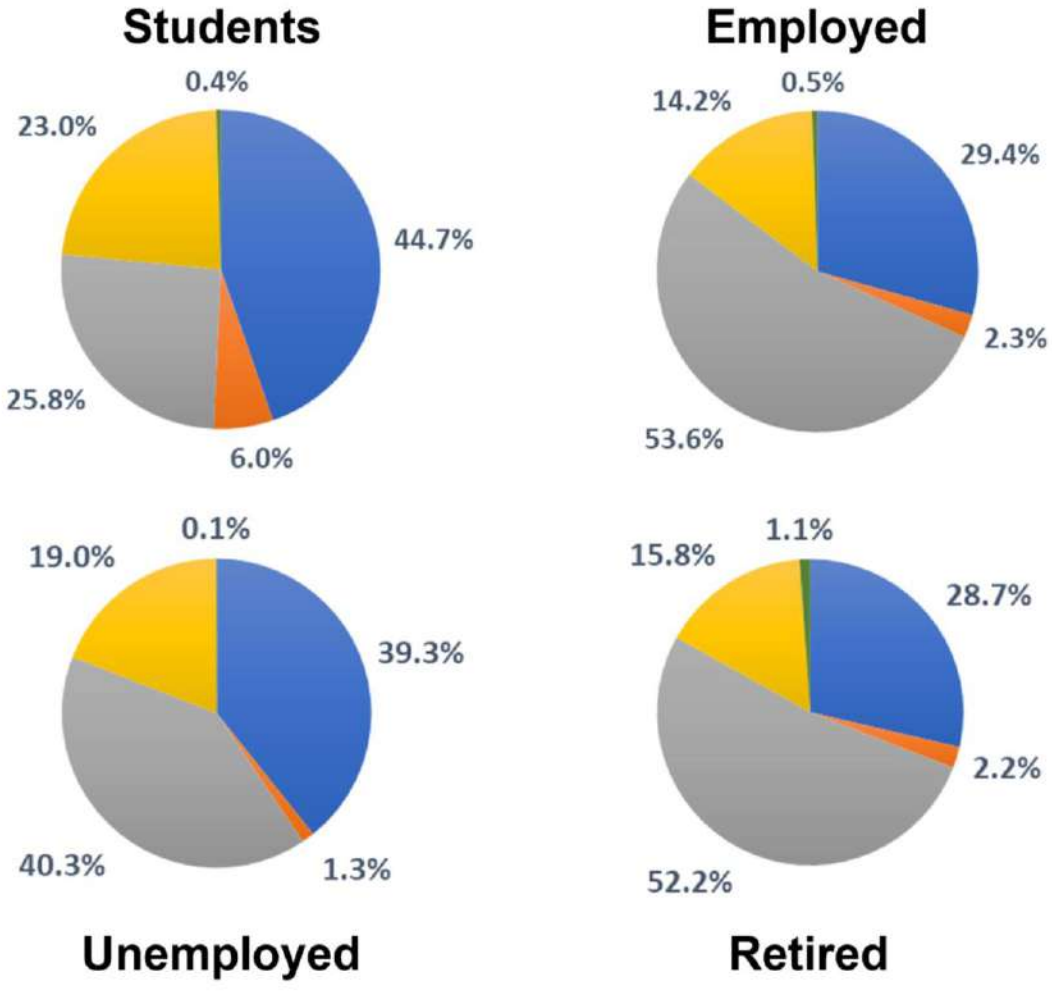
Result reasonable for urban / suburban context (2.5% in IMQ 2013)



Excluding multi-modal trips:

- **Car** is the most used mode (**49%**)
- **Bikes** are used for a minority of trips (less than **3%**)
- **Public transport** (bus, metro, tram, train) trips represent **16%** of the mobility

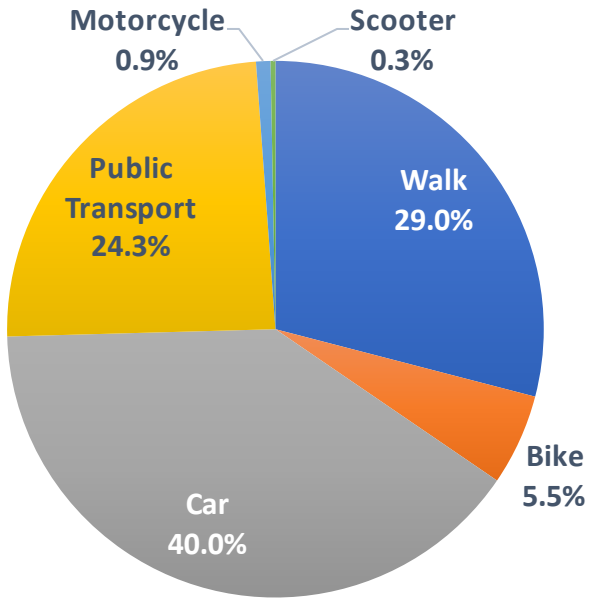
Modal shares in Turin Functional Urban Area



- **Students** use car only for 25.8% of the trips, they use **Public Transport** (44.7%) and **Bike** (6%) instead
- **Employed** and **retired** show a large use of **cars** (more than 50%)
- **Unemployed walk** and use **Public Transport** more than the average

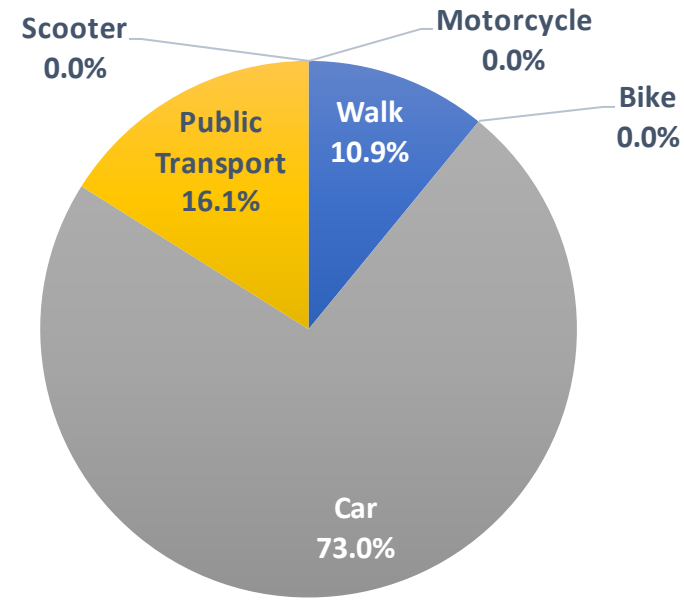
Commuting trips: modal share

Turin municipality



Moby App

Rest of the Functional Urban Area



Walk
Bike
Car
Public Transport
Motorcycle
Scooter
Taxi / NCC

Trip duration

23,5

Minutes/trip

- About half of the trips last **less than 15 minutes**
- **35%** of the trips last **less than 10 minutes**

Italian cities

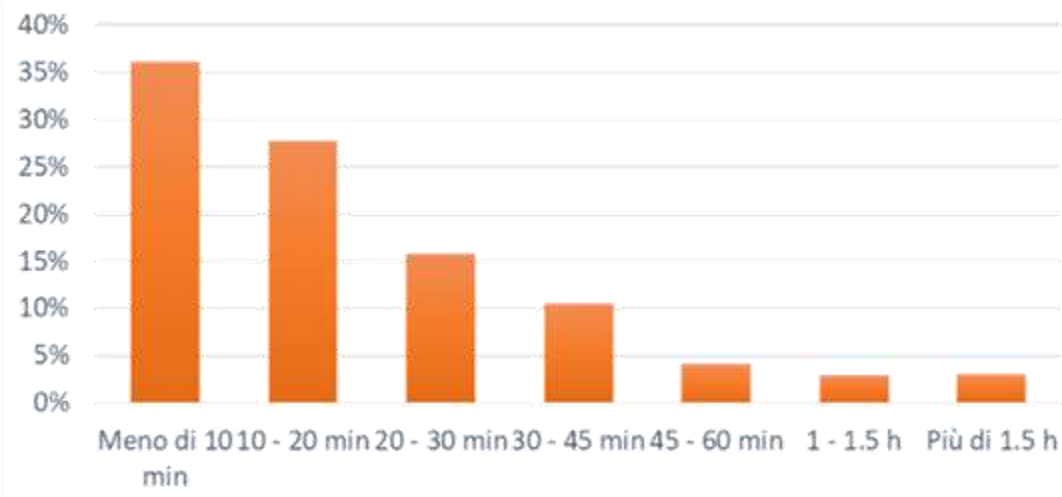
29 minutes/trip in **2021**

(New Mobility Patterns – Forthcoming EU publication)

19 minutes/trip in **2019**

(Mobilitaria 2022 - ISFORT AUDIMOB)

Distribution of trips by duration



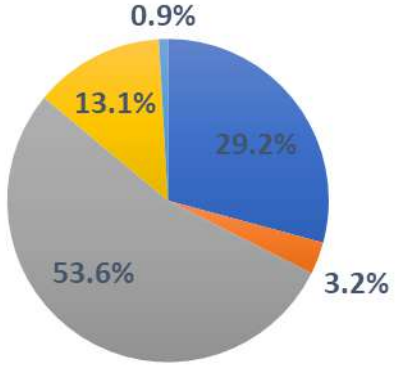
24% of car trips is very short (**less than 10 minutes**)

Private car is used for trips where **active modes** are very competitive

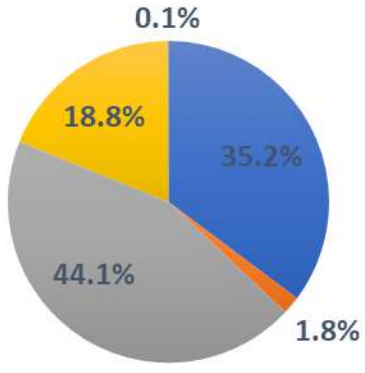
Mobility and gender

Men	Women
3.0	3.3
Trips/day	Trips/day

Modal share (men)



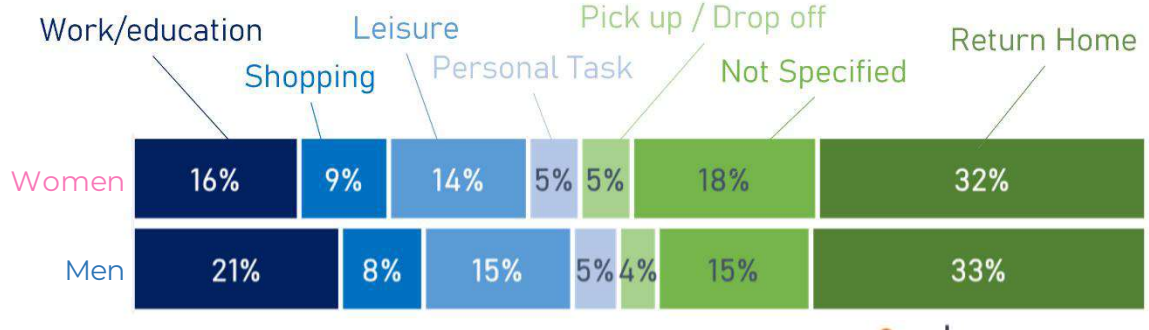
Modal share (women)



- Walk
- Bike
- Scooter/motorcycle
- Car
- Public Transport

Women make **more trips** on average, moving more **on foot** and by **Public Transport**.

Trip purposes



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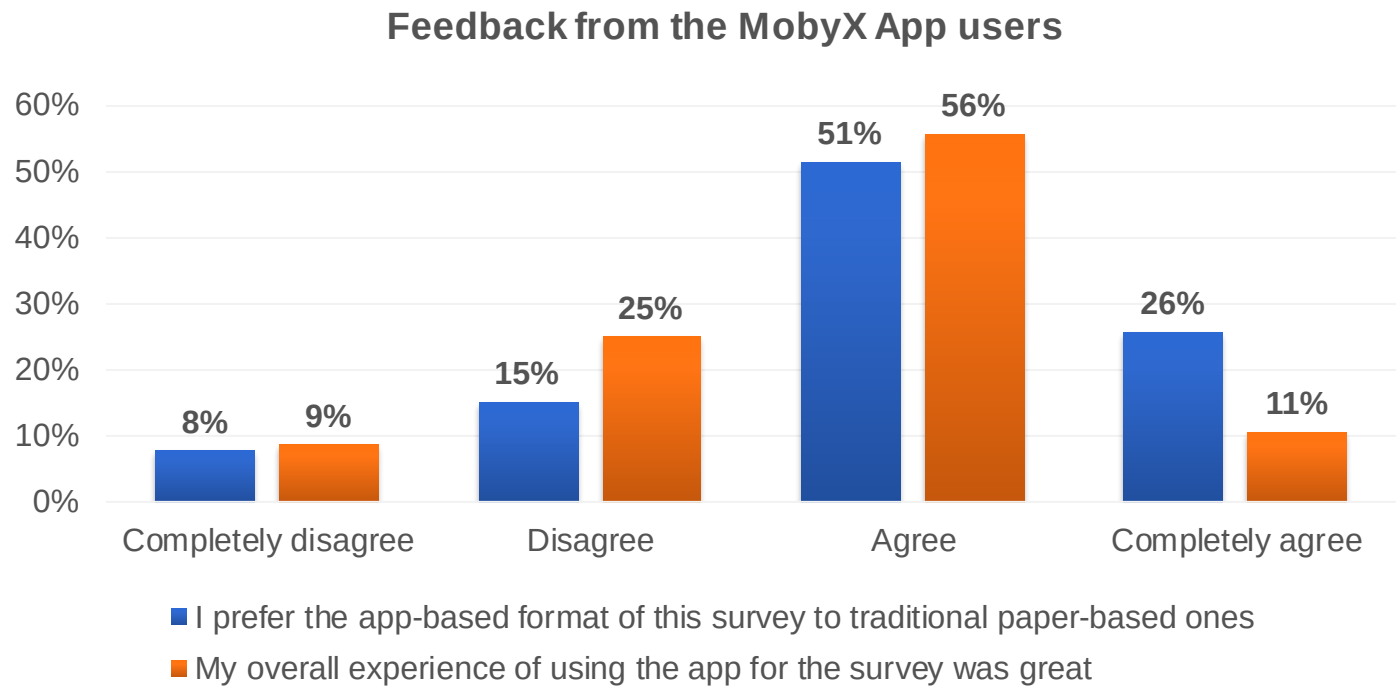
Users' Feedback



Conclusions

MobyApp allows to collect

- Number of trips, modes, duration, path, etc.
- **Additional information** managed through the application (e.g.: private or shared vehicle, public transport line, parking price, etc.)

MobyApp could be **improved** with reference to:

- **Public Transport** detection (not automatically recognized yet)
- **Trips validation process** by the user
- **GPS and MobyApp** always active in background

Role and support of a **survey company** for participant recruitment and management

The data collection approach with MobyApp works, and provides a **reasonable** overall **picture of personal mobility**, offering useful information to **transport modelers** and **urban planners**

HARMONY questionnaire

HARMONY questionnaire

HARMONY

SPATIAL & TRANSPORT PLANNING FOR A NEW MOBILITY ERA

THANK YOU!

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