

Analysis framework and results of the SBB Green Class pilot studies

Setting: Two large-scale (189 participants), long-term (1-year) and high-resolution (24/7 user-labelled GPS tracking) pilot studies [1] to test multi-modal mobility flat rates. Participants are equipped with a GA 1st or 2nd class, bike- and car-sharing credit and either an Electric Vehicle (EV) with P+Rail or an Electric Bike.

Analysis: Survey and GPS travel diary data was analysed over time and compared to Swiss mobility microcensus data.

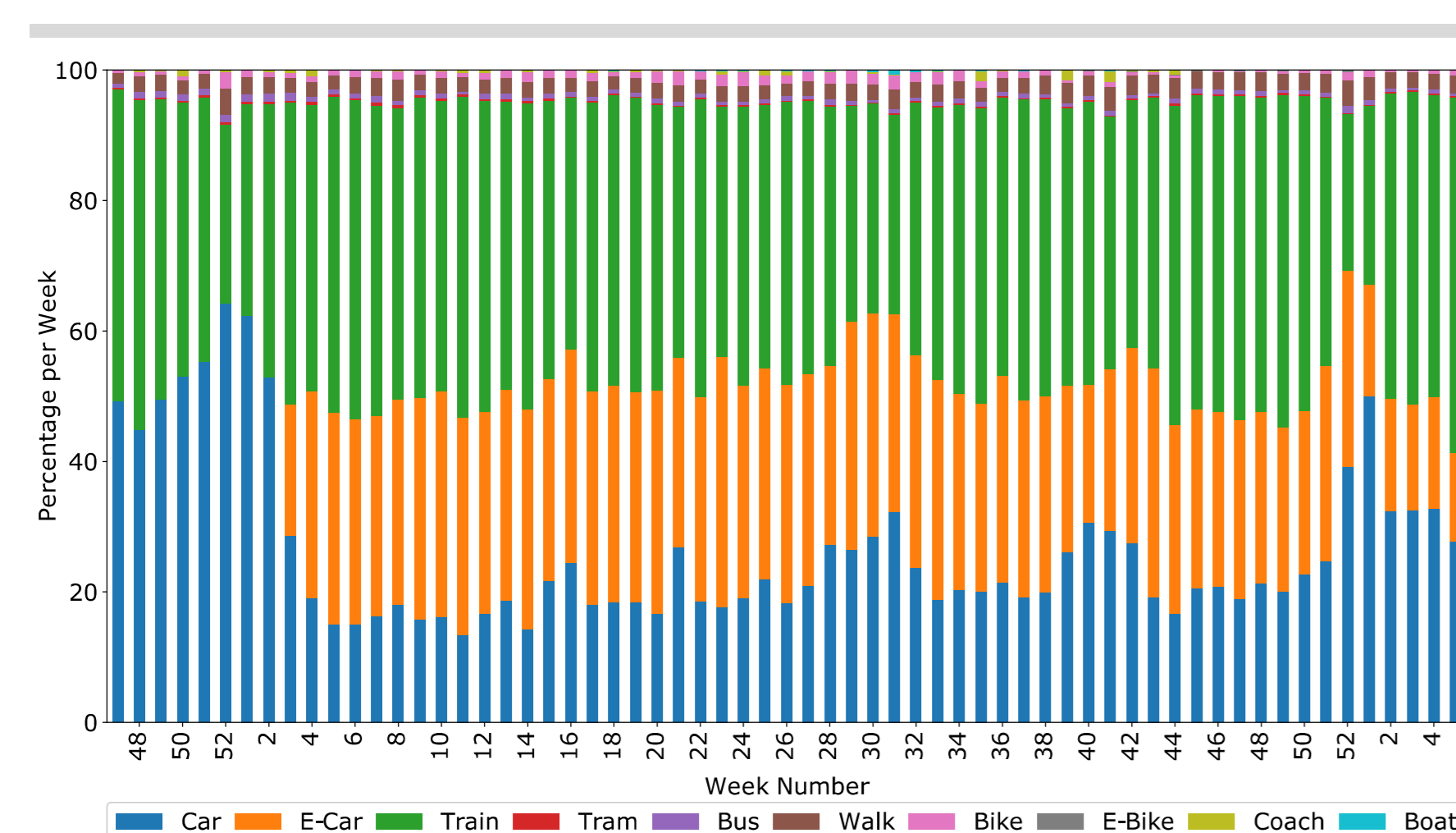
Results:

- Users integrate new mobility options into their mobility mix.
- New mobility options are used in combination with trains and local public transport.
- Replacing the conventional car with an electric car led to significantly lower average CO₂ emissions.

Henry Martin, Dominik Bucher, David Jonietz, Martin Raubal
Institute of Cartography and Geoinformation, ETH Zurich
Stefano-Francini-Platz 5, 8093 Zurich, Switzerland
martinhe@ethz.ch, dobucher@ethz.ch, mraubal@ethz.ch

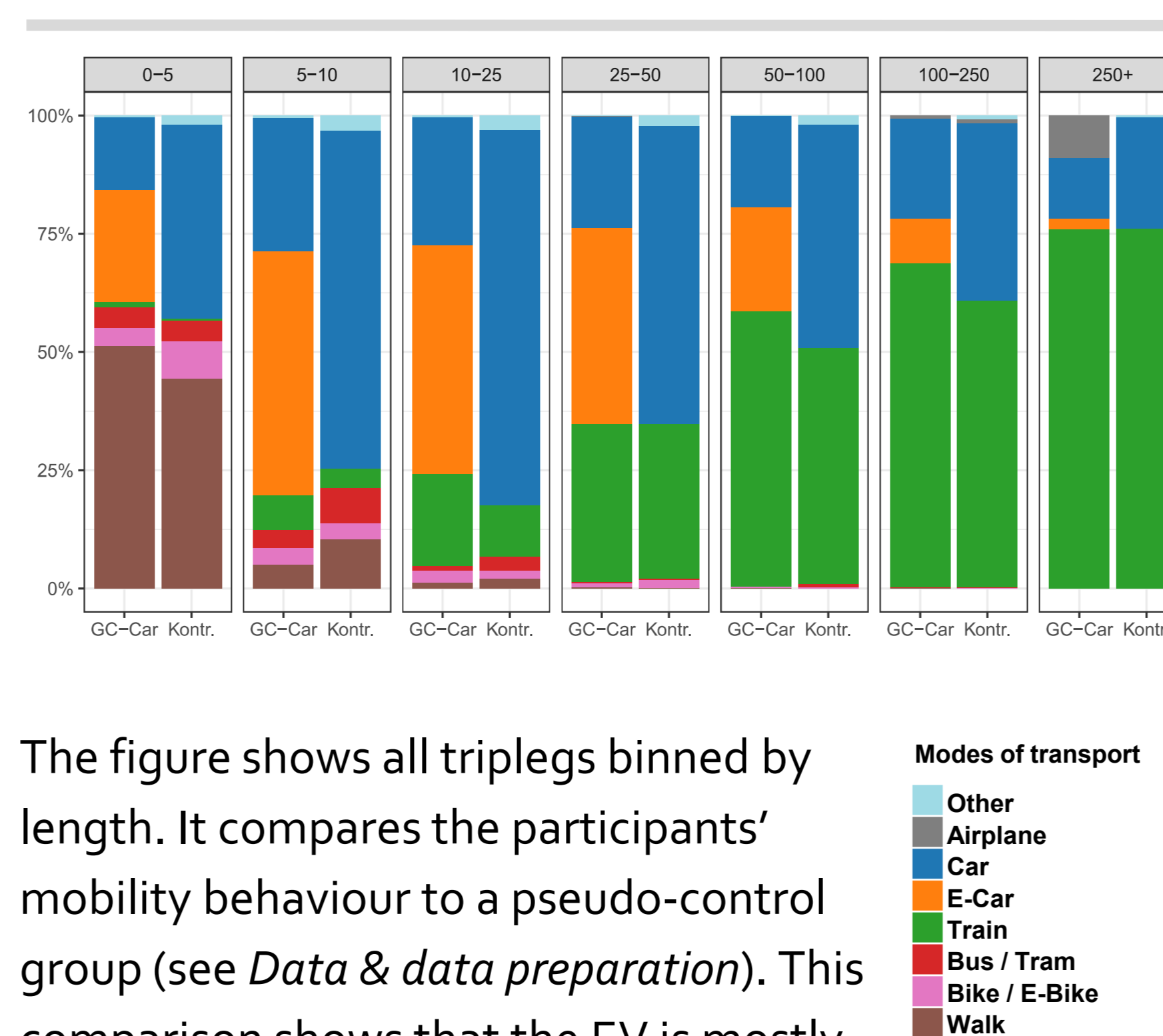
Henrik Becker, Kay W. Axhausen
Institute for Transport Planning and Systems, ETH Zurich
Stefano-Francini-Platz 5, 8093 Zurich, Switzerland
axhausen@ivt.baug.ethz.ch

Result 1: Modal split



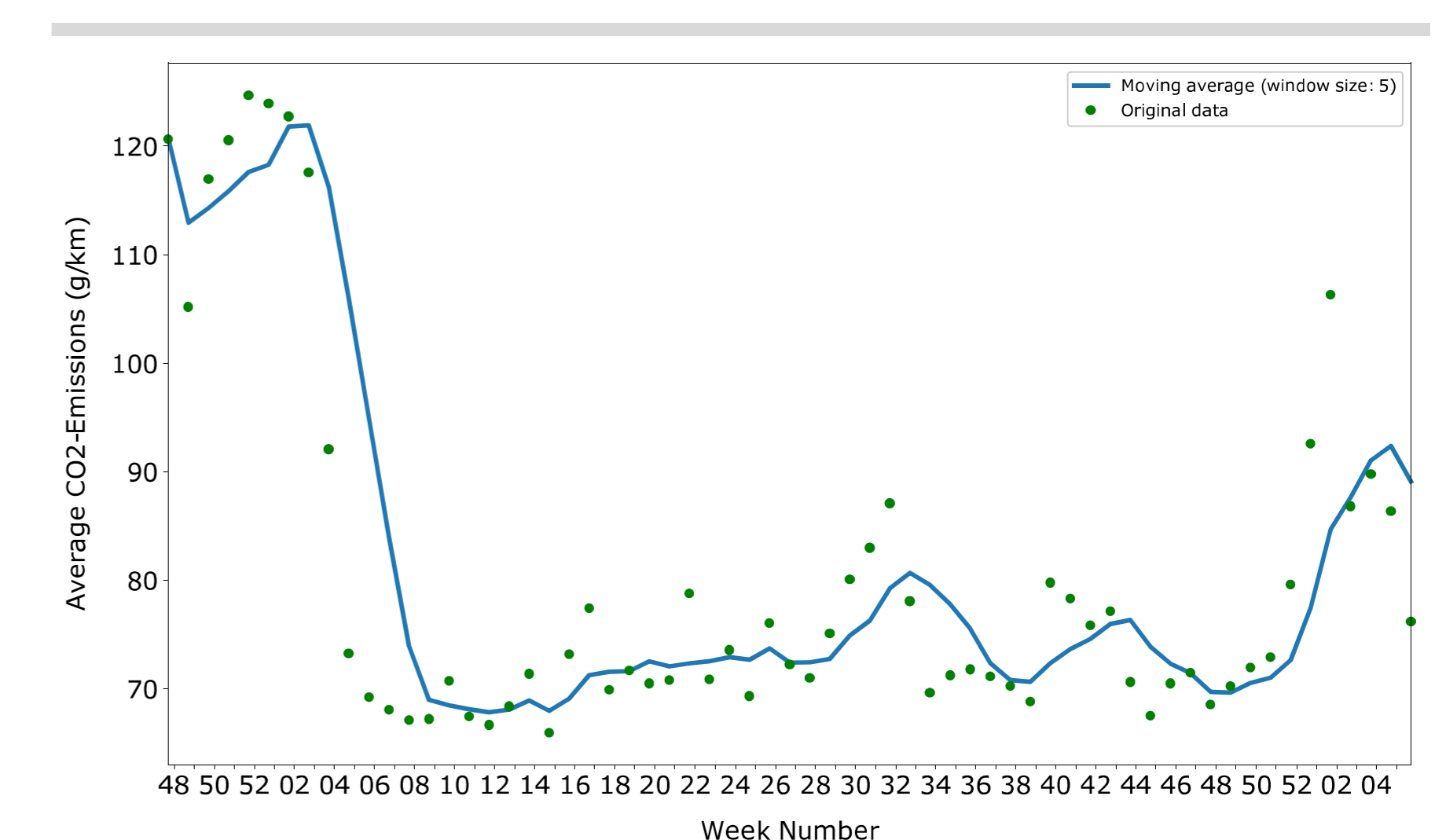
The modal split of the participants of the Green Class (GC) E-Car pilot study shows that the electric vehicle (EV) becomes a permanent part of the participants' mobility mix. Furthermore, the EV is used in combination with public transport and mostly replaces trips made with the conventional (fossil-fuel based) car.

Result 2: Mode choice



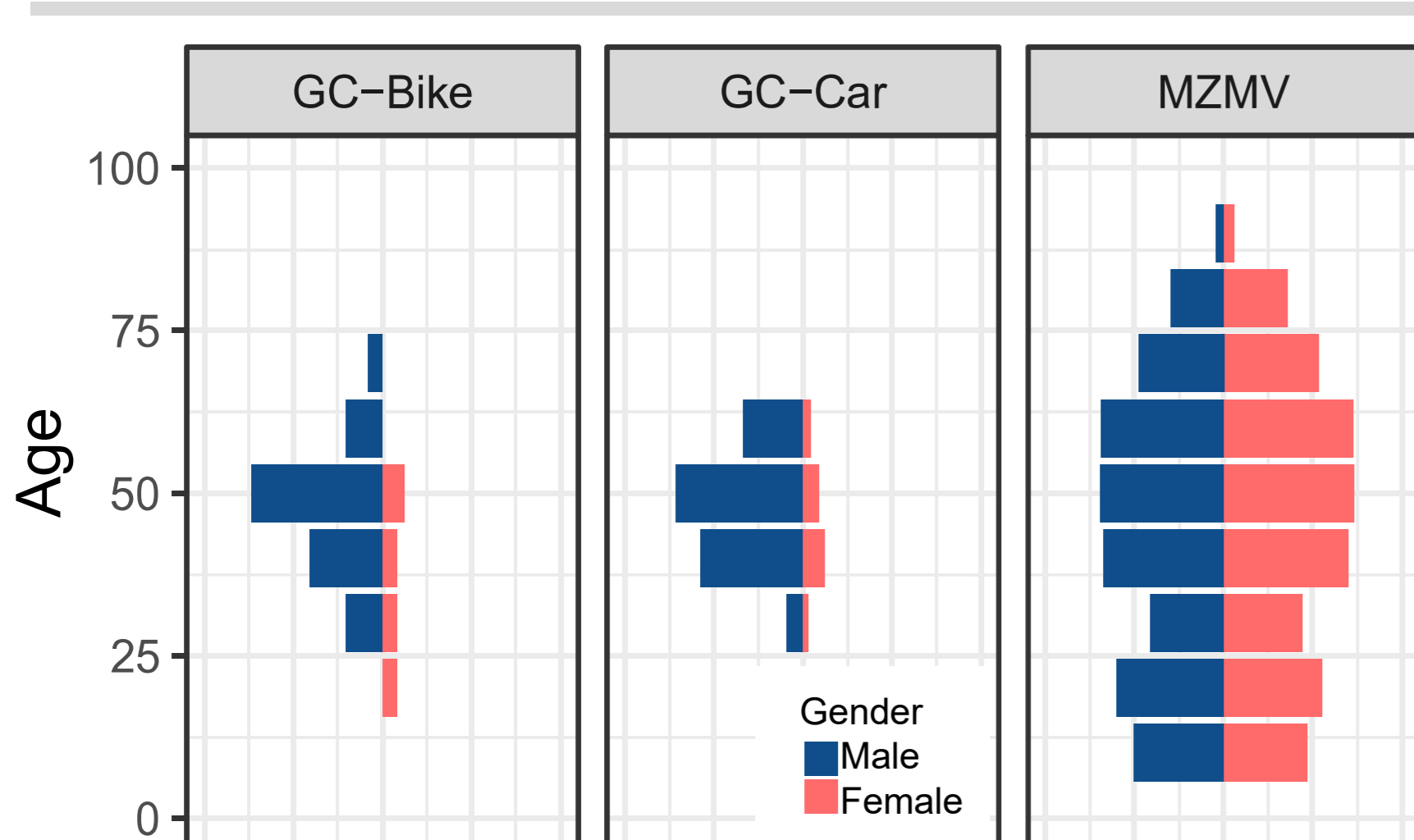
The figure shows all triplets binned by length. It compares the participants' mobility behaviour to a pseudo-control group (see *Data & data preparation*). This comparison shows that the EV is mostly replacing the conventional car and not train and public transport. Furthermore, there is a preference for the EV for shorter distances.

Result 3: CO₂ reduction



The moving average of the weekly CO₂-emissions of Green Class E-Car participants shows a strong reduction at the beginning of the project (~week 7). CO₂-emissions stay on a low level except for peaks during holidays. The reduction can be explained by the replacement of the fossil-fuel based car with the EV while conserving the share of public transport.

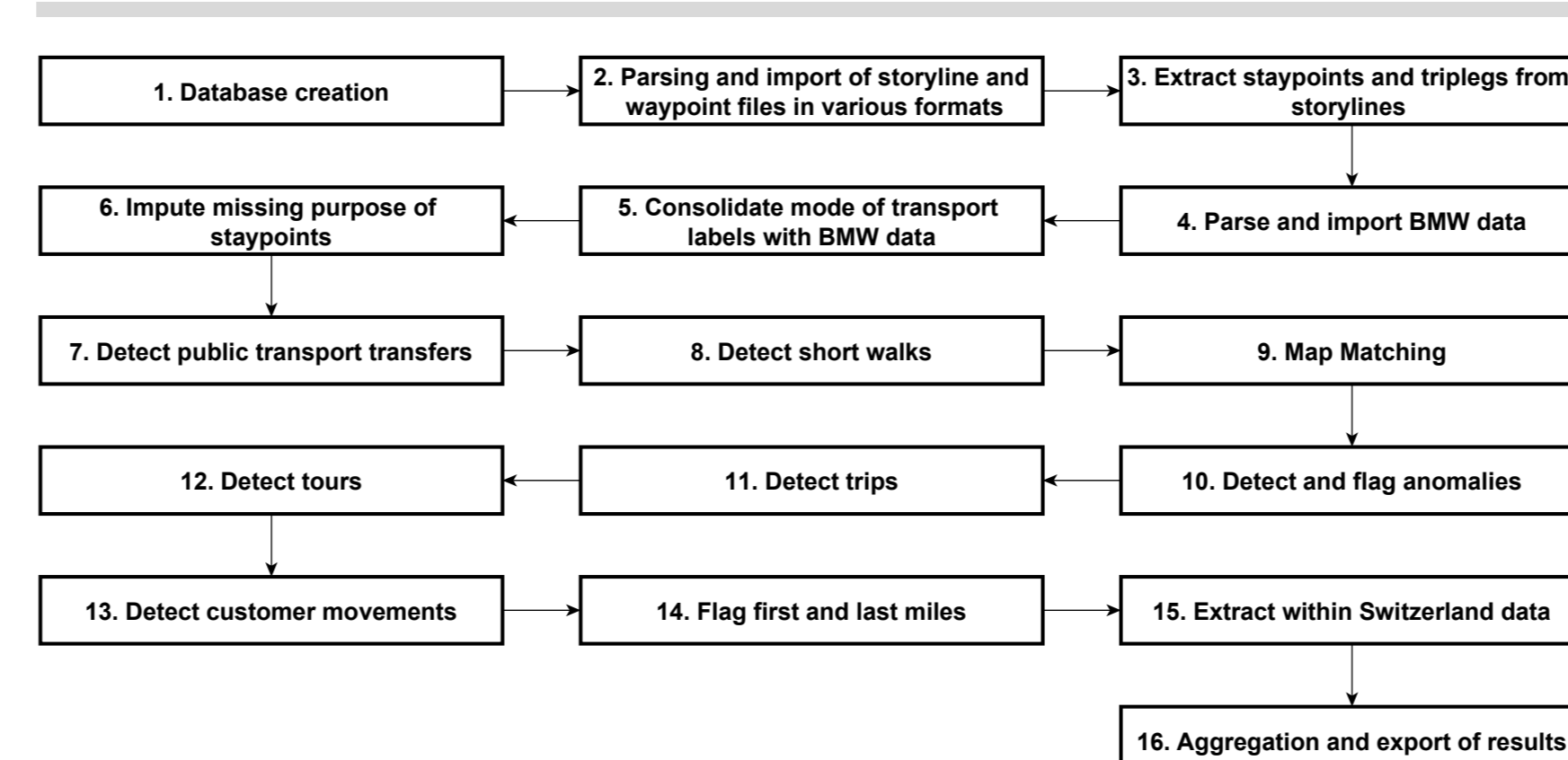
Mobility package and participants



E-Car pilot study: 139 participants with train pass (GA 1st Class), BMW i3 EV, P+Rail parking space, mobility car-sharing and PubliBike bike-sharing.

E-Bike pilot study: 50 participants with train pass (GA 1st or 2nd Class), Stromer E-Bike and mobility car sharing. Both samples are not representative for the Swiss population in terms of gender, age, average household income and mobility. All participants were tracked ~6 weeks before the project started.

Data & data preparation



Preparation of travel diary data: Participants are tracked using an app based on tracking technology from MotionTag [3]. We perform several preprocessing steps shown in the workflow above.

Comparison to mobility microcensus data: We generate a pseudo-control group by filtering and re-weighting the Swiss Mobility and Transport Microcensus according to the demographics of the GC participants using an iterative proportional fitting approach (IPF) [4].

Expected impact

Many of today's urgent challenges, especially climate change and green house gas emissions are closely linked to the movement of people and goods. A possible path towards a more **sustainable transport sector** is given by the concept of **Mobility as a Service (MaaS)**. **SBB Green Class** is one of the first large pilot projects for a **multi-modal mobility flat rate**. Despite the non-representative sample, the results are a detailed observation of **MaaS first movers** that have access to a comprehensive mobility package.

The results show that **users integrate the new mobility options** into their mobility mix in the long term and use them in **combination with public transport**. In particular, replacing the conventional car with an electric car leads to significantly lower CO₂-emissions on average.

In the future, we expect that MaaS offers will become more common and more affordable and therefore will be adopted by a substantial portion of the population.

References

[1] <https://www.sbb.ch/en/travelcards-and-tickets/railpasses/greenclass/about-sbb-green-class/pilot-projects.html>

[2] Bundesamt für Statistik (BFS) und Bundesamt für Raumentwicklung (ARE) (2017) Verkehrsverhalten der Bevölkerung - Ergebnisse des Mikrozensus Mobilität und Verkehr 2015

[3] <https://motion-tag.com/en/>

[4] Stephan, F. F. (1942) Iterative method of adjusting frequency tables when expected margins are known, *Annals of Mathematical Statistics*, **13** (2) 166–178

Partners