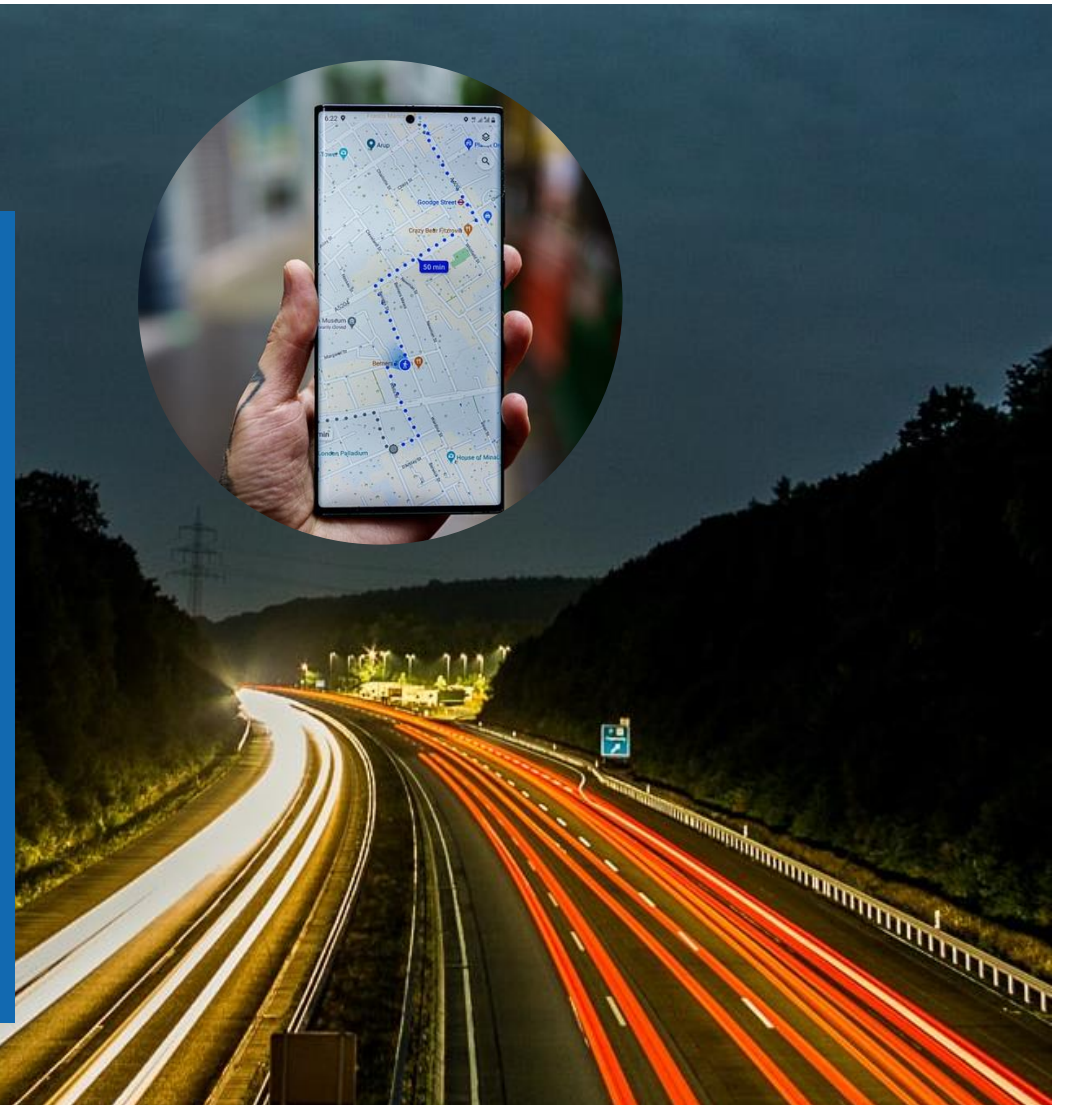


Spatial data analytics for sustainable mobility

Prof. Dr. Martin Raubal

Department of Civil, Environmental and Geomatic
Engineering, ETH Zurich & Singapore-ETH Centre
19 November 2021

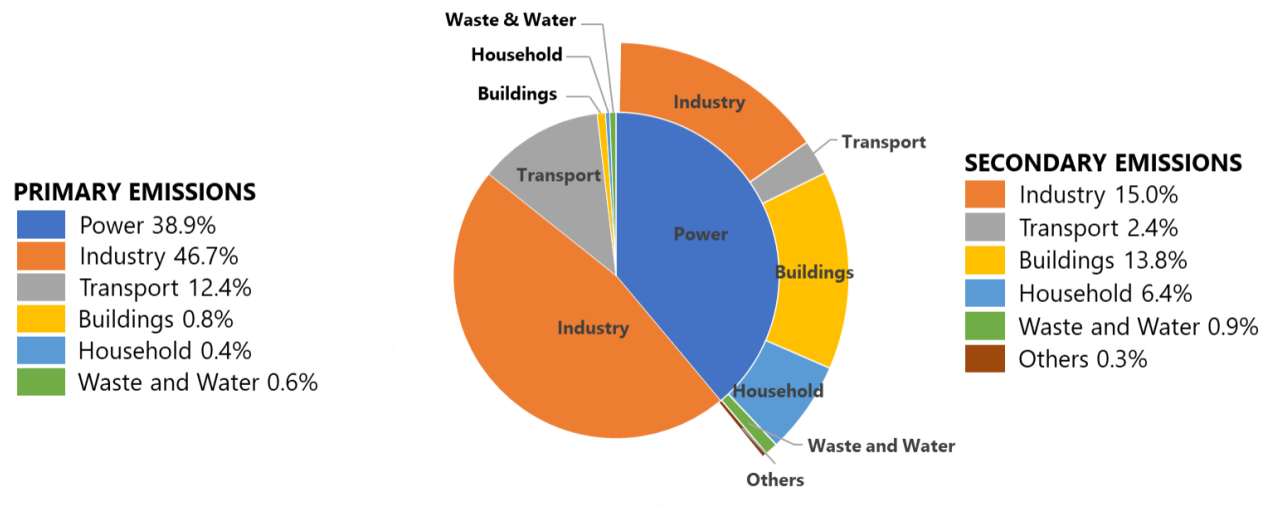
Urban Sustainability R&D e-Symposia 2021 –
Urban Analytics



Our society has become increasingly mobile.

EMISSIONS PROFILE (2018)

Total emissions: ~52MtCO₂e



<https://www.nccs.gov.sg/singapores-climate-action/singapore-emissions-profile/>



Foto: Maxiphoto / iStock



Foto: Theodore Lim; Nanyang Chronicle



SUSTAINABLE DEVELOPMENT GOALS



Spatial Data Analytics

- From looking at **where** things happen to understand **why** they happen there.
- Analyse & visualise **location, distance & spatial interactions** as core aspects of the data.
- *80% of the informational needs of local government policymakers are related to geographic location.*



Sustainable mobility

- Guaranteeing mobility needs in an environmentally friendly way over the long term
- Technical and non-technical measures

Mobility-as-a-Service (MaaS)



Bild: Transport advancement

Shared Mobility

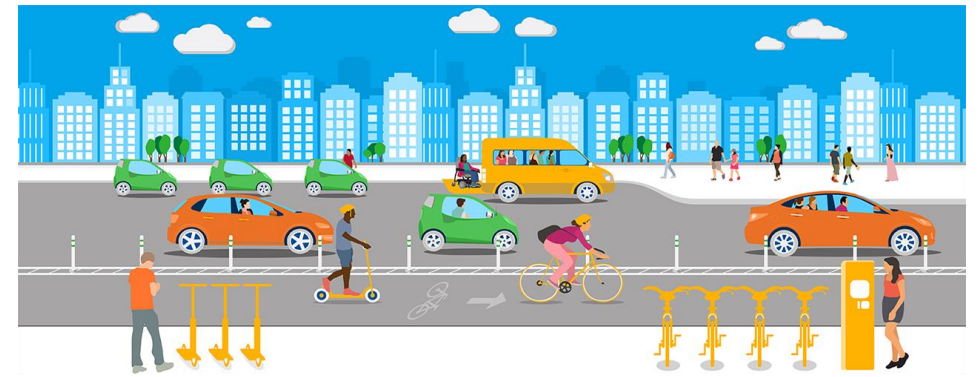


Bild: SAE International

E-Mobility



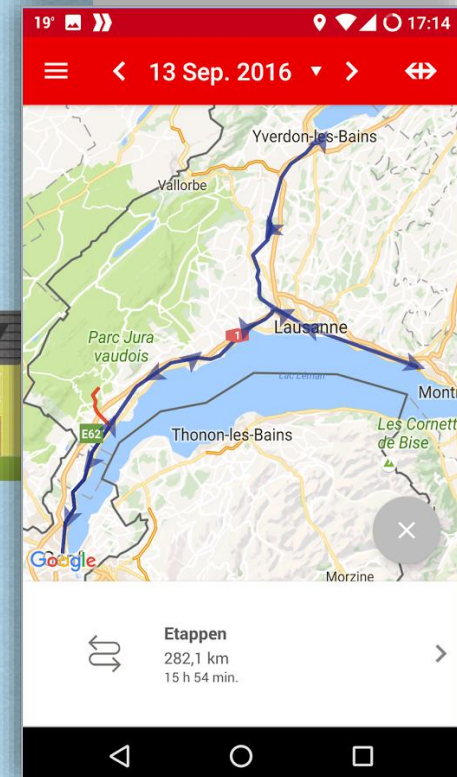
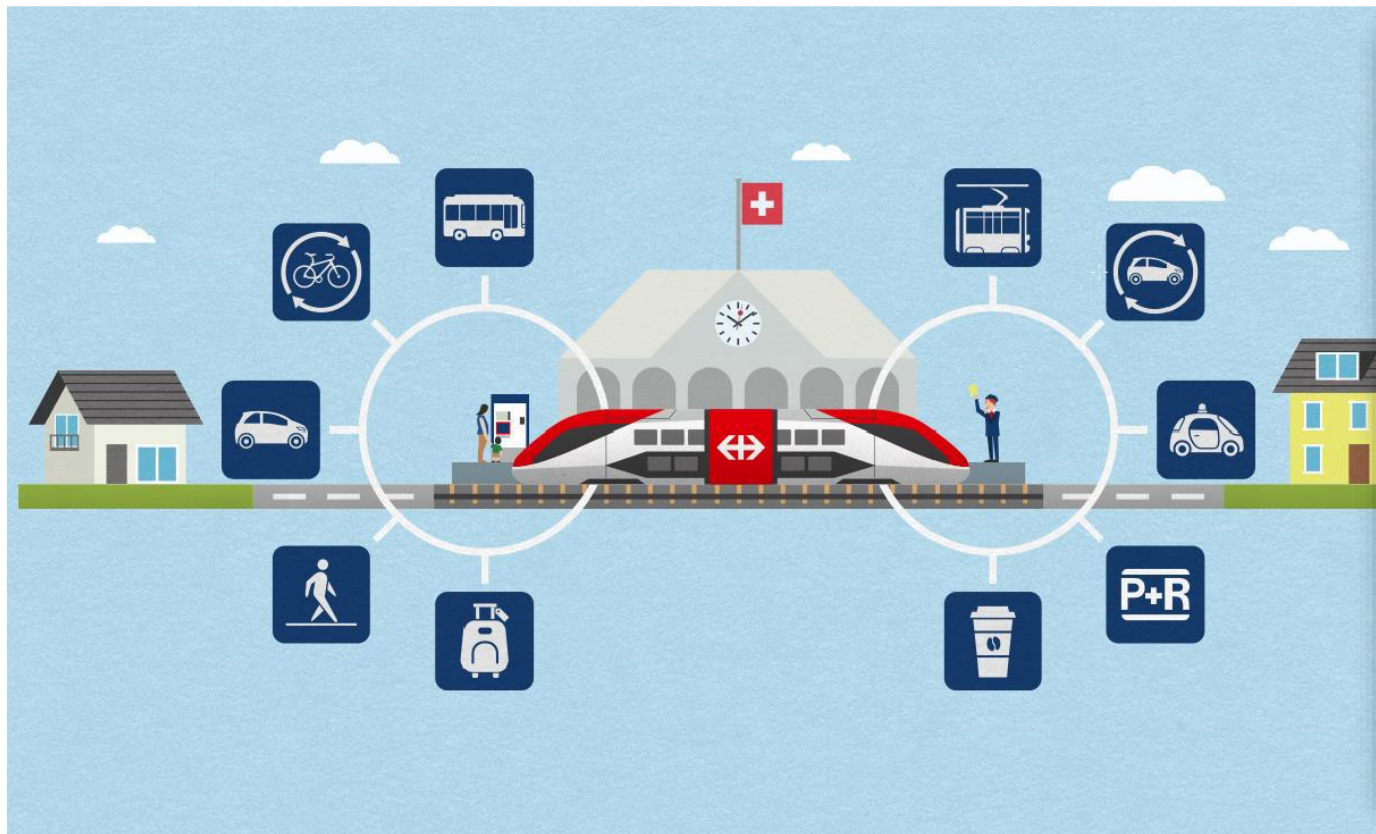
Quelle: dpa-tmn

Mobility as a Service



www.motorfinanceonline.com

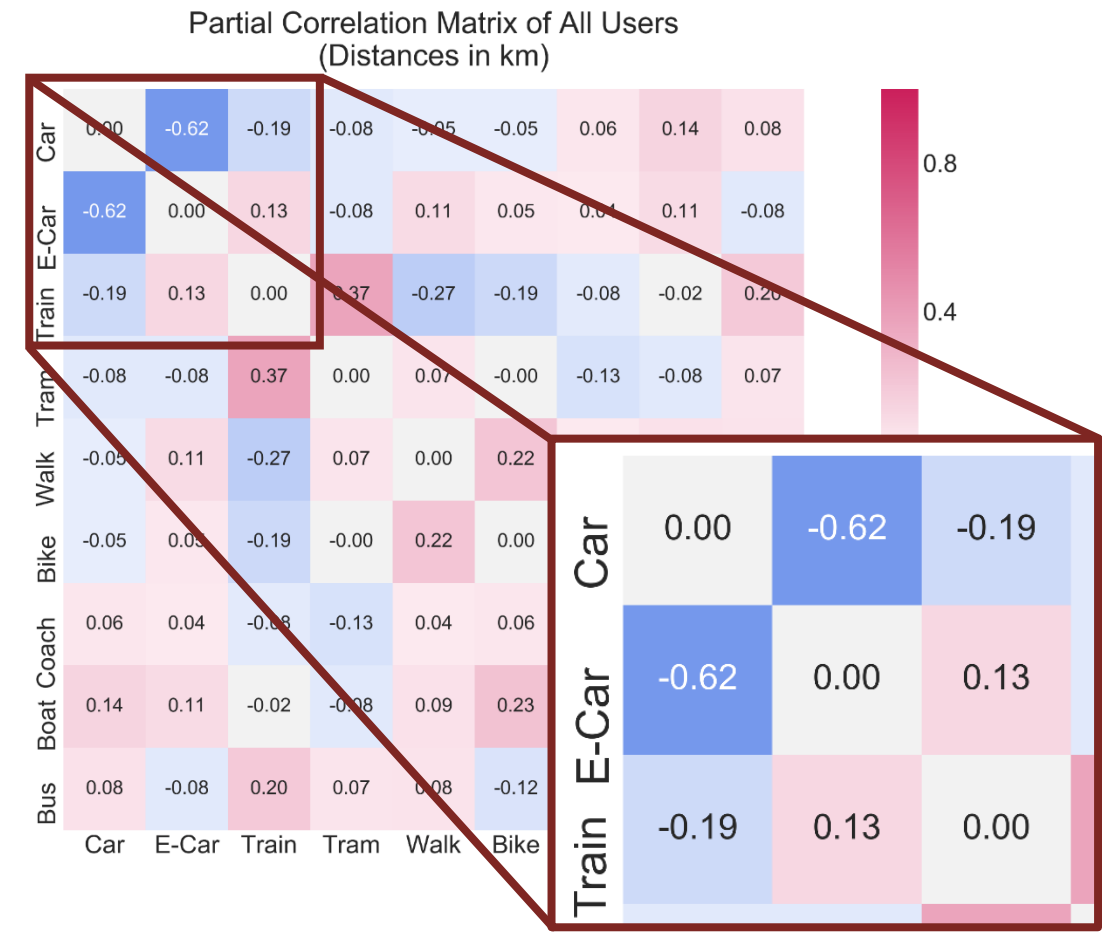
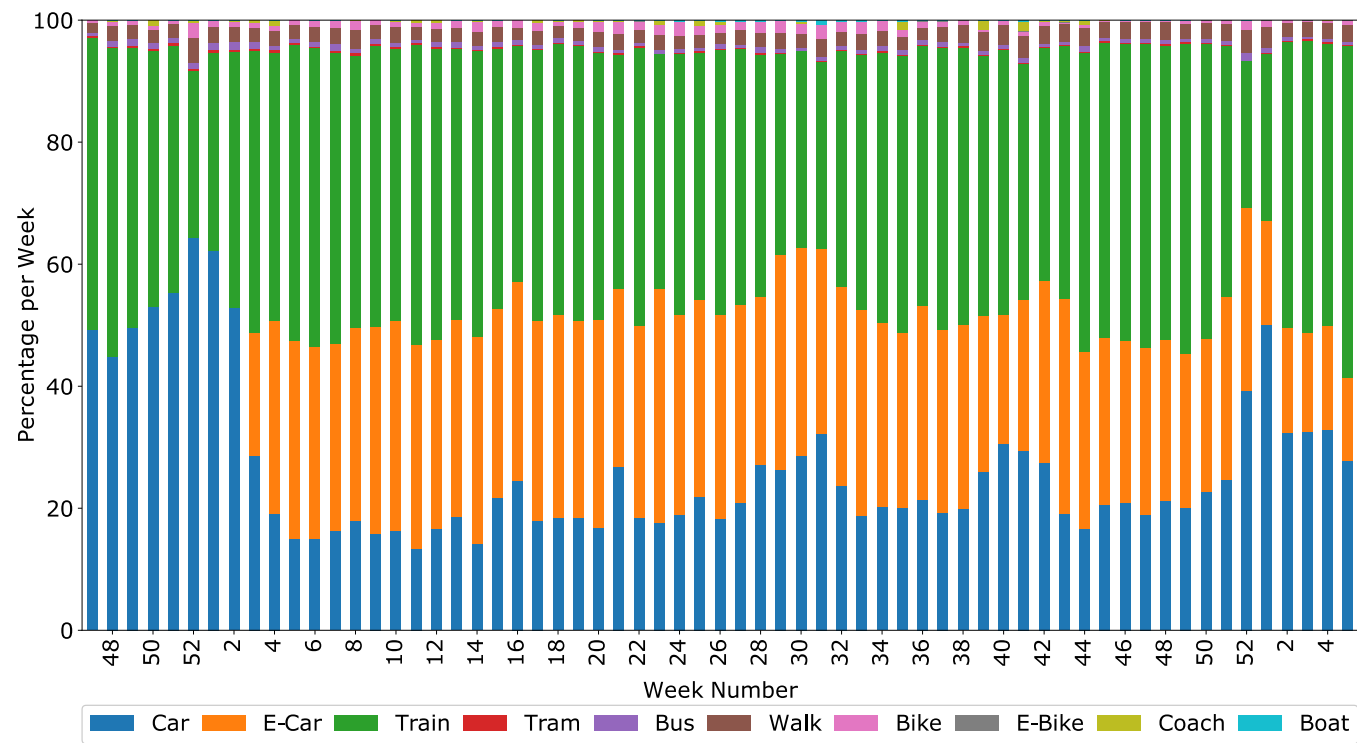
Mobility as a Service – SBB Green Class



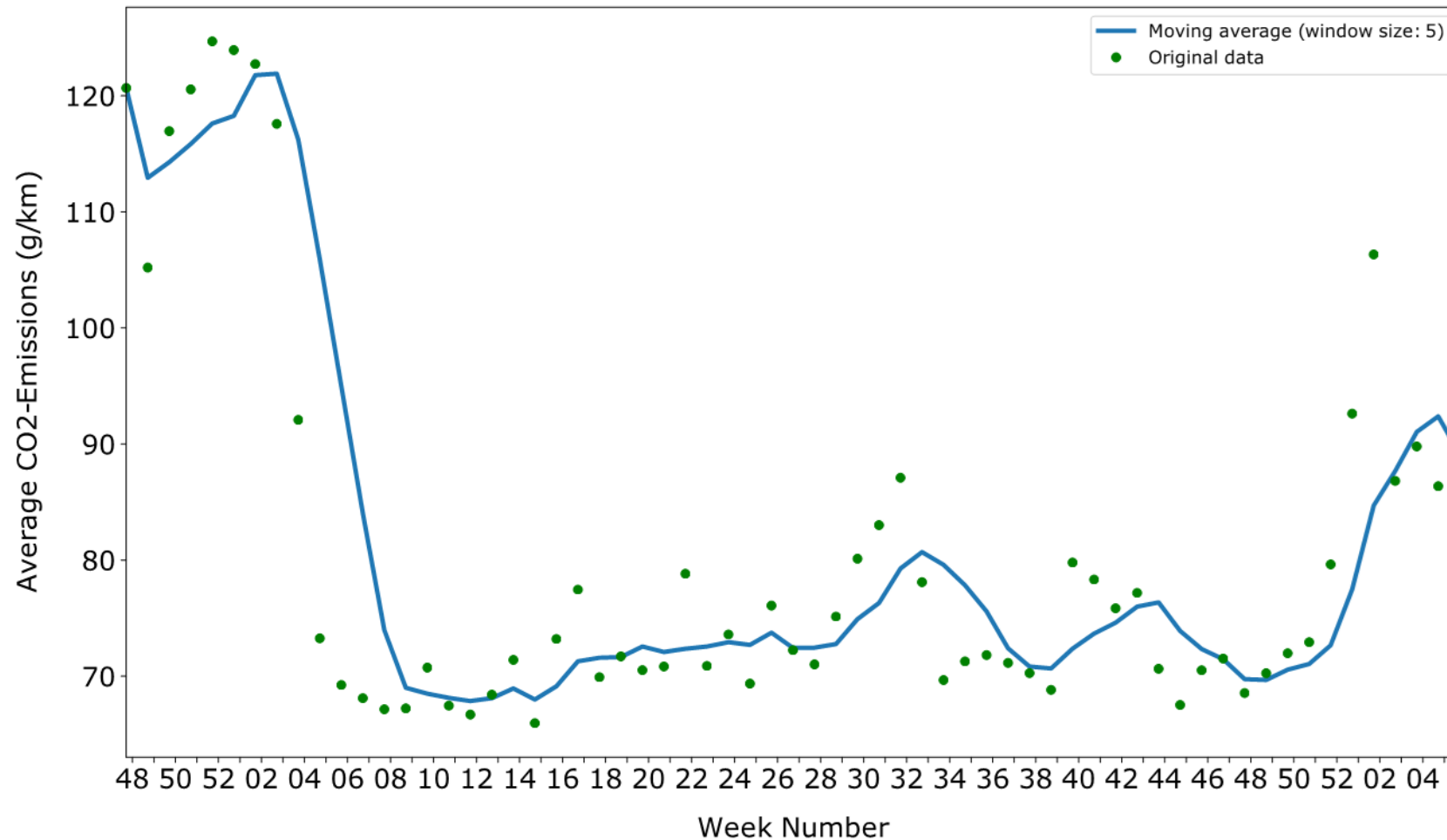
Big movement data

	Green Class 1	Green Class 2
Users	139	50
Tracking time	Nov 16 – Jan 18 (15 months)	Aug. 17 – Aug 18 (12 months)
GPS position fixes	227 M	74 M
Stay points	326'926	87'884
Trips	242'012	62'470
Total km tracked	5.7 M	2.15 M

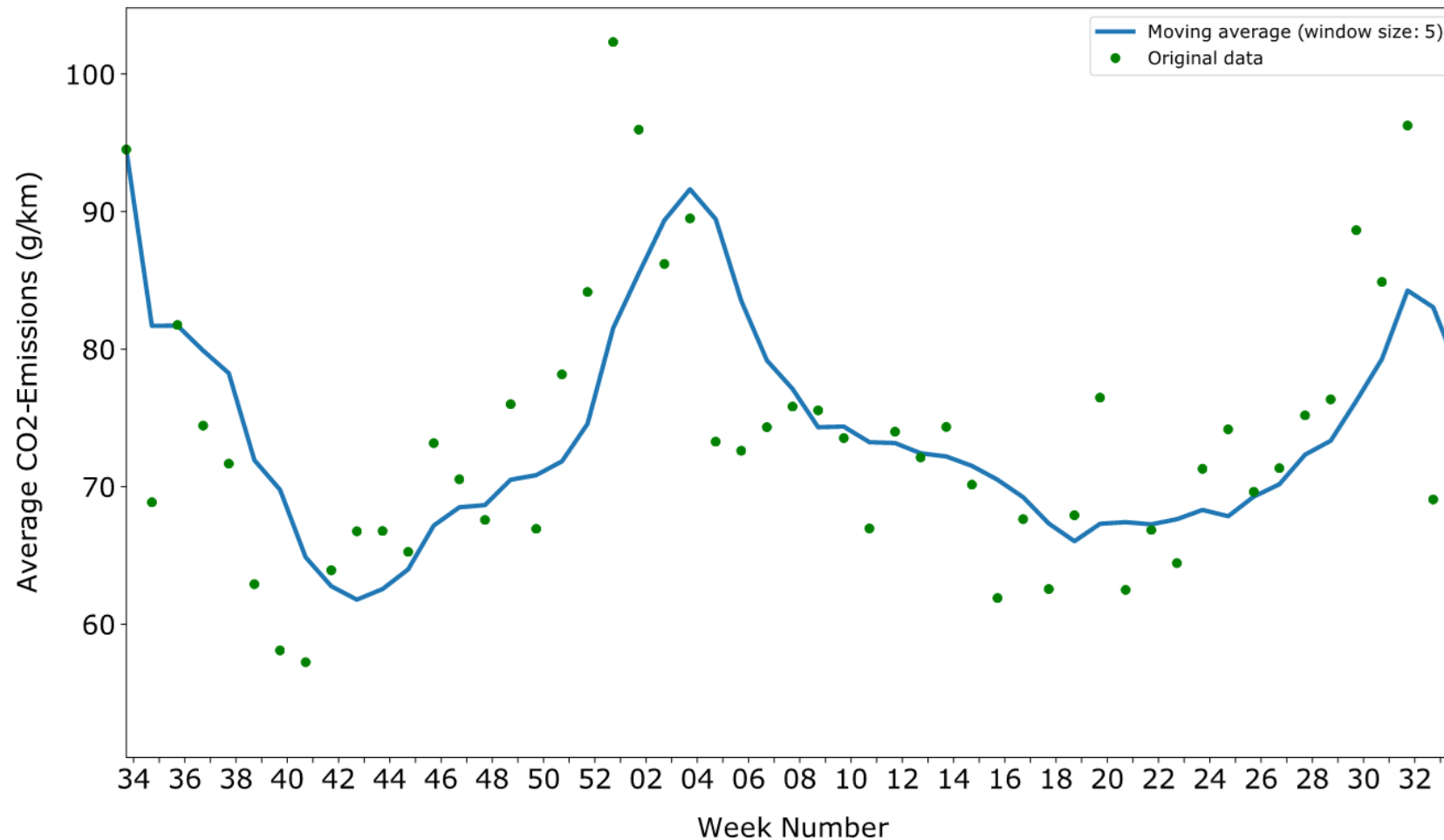
Result 1: E-car becomes part of mobility mix (in the long term)



Result 2: New mobility options can reduce CO₂ emissions



Result 3: Without the replacement of conventional cars, CO₂ emission reduction is unstable

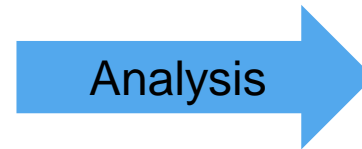


Mobility behavior change



<https://www.alpine-region.eu/>

How to accelerate people's transition towards **energy-efficient mobility options** and overcome firmly established habits?



Mobility behavior change - *GoEco!*



- How can we assess and influence the **mobility behavior** of people?
- Can we use **gamification** to nudge people towards more ecologically sustainable mobility?
- **App-based tracking** of individual mobility

ETH zürich

Scuola universitaria professionale
della Svizzera italiana

SUPSI

FNSNF

SCHWEIZERISCHER NATIONALFONDS
ZUR FÖRDERUNG DER WISSENSCHAFTLICHEN FORSCHUNG

71
NRP

Managing Energy Consumption
National Research Programme



EIN COMMUNITY-BASIERTER ECO-FEEDBACK-ANSATZ UM
NACHHALTIGES PERSÖNLICHES MOBILITÄTSVERHALTEN ZU FÖRDERN

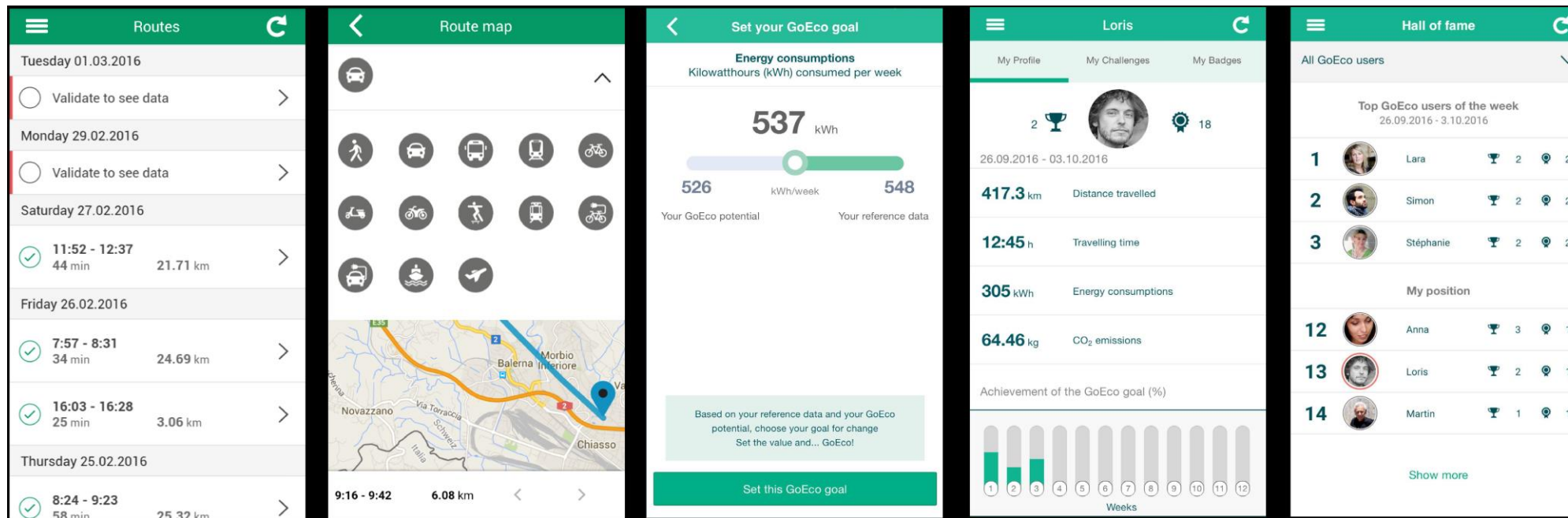
www.goeco-project.ch



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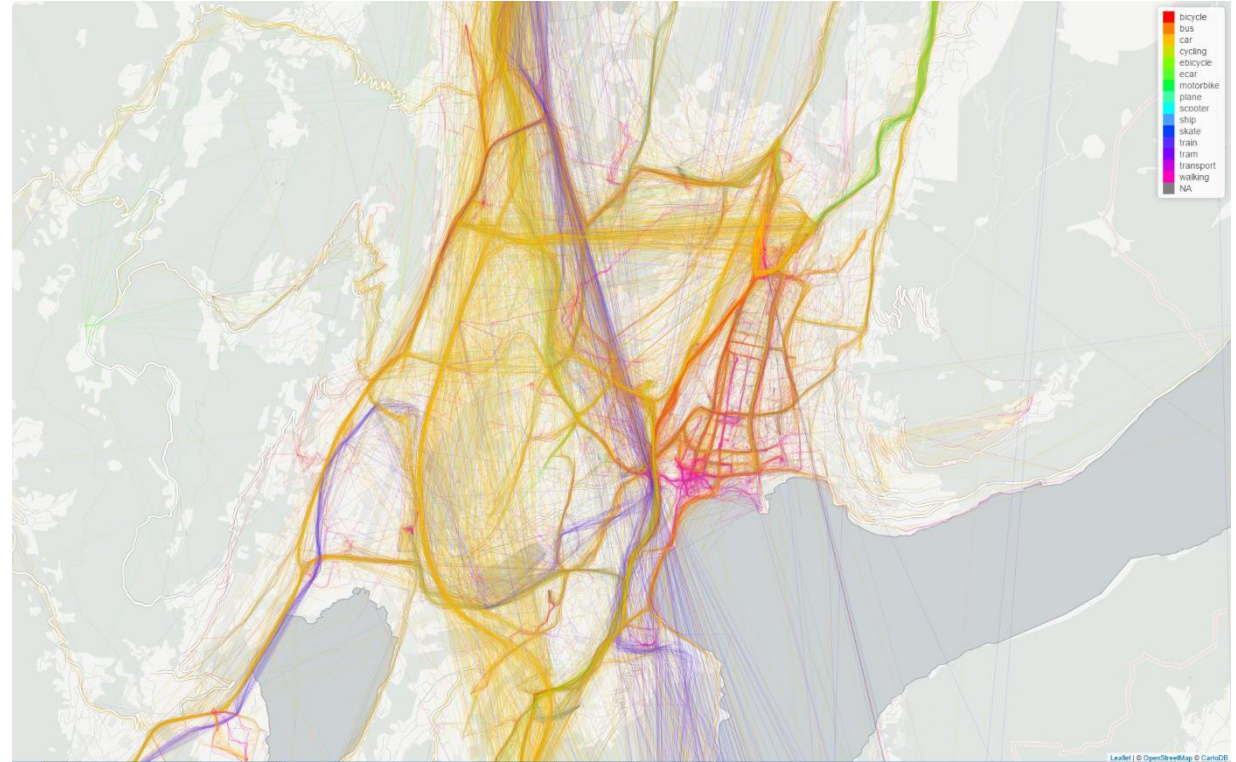




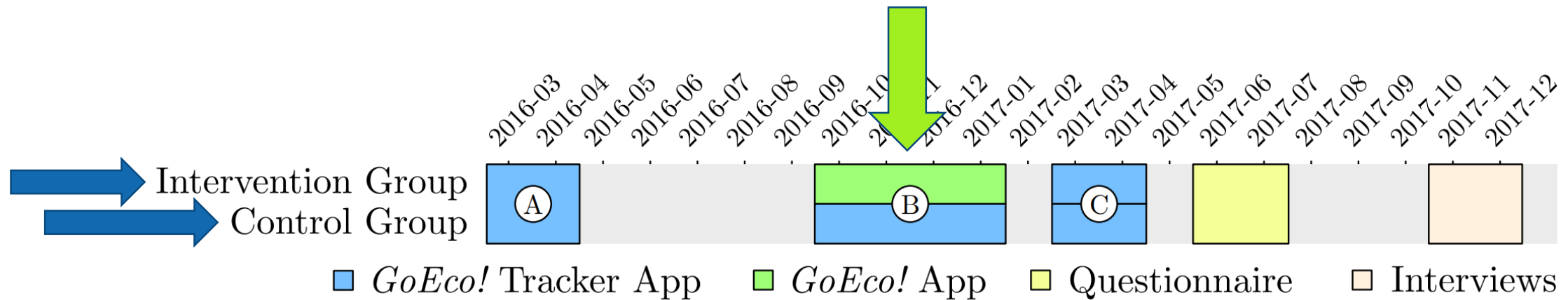
Zürich



Ticino



GoEco! experiment – Mobility tracking periods



- 600 participants from Zurich & Ticino
- 3 tracking periods of 2-4 months (tracking, intervention, tracking)
- Questionnaires & interviews
- High dropout rate: ~150 participants at the end

GoEco! summary

- GoEco! could bring about change in people's mobility behavior.
- There was a reduction in both average energy consumption as well as CO₂ emissions per km.
 - For *systematic* routes, i.e., those travelled on a regular basis (work-home).
 - In Ticino – for Zurich we observed an increase in routes by foot and bicycle, but the sample was too small to generalize to the overall population.

Conclusions

- Future sustainable mobility depends on highly complex and inter-related technological, social, economic and political developments.
- Spatial data analytics can help to
 - evaluate & predict people's mobility behavior,
 - determine long-term behavior change;
- Reducing CO₂ emissions depends on technical and non-technical measures:
Mobility as a Service, apps & gamification
- **Spatial Data Analytics is essential for Sustainable Mobility.**

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