

# Preferred citation style

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Axhausen, K.W. (2023) What dilemmas are we facing when planning the future public mobility and which transport solutions could play a role the future?, on-line input, *Seminar of the Expert Committee in Public Mobility*, Kopenhagen, September 2023.

What dilemmas are we facing when planning the future public mobility and which transport solutions could play a role the future?

KW Axhausen

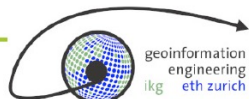
IVT  
ETH  
Zürich

September 2023

**DBAUG**

**ETH**

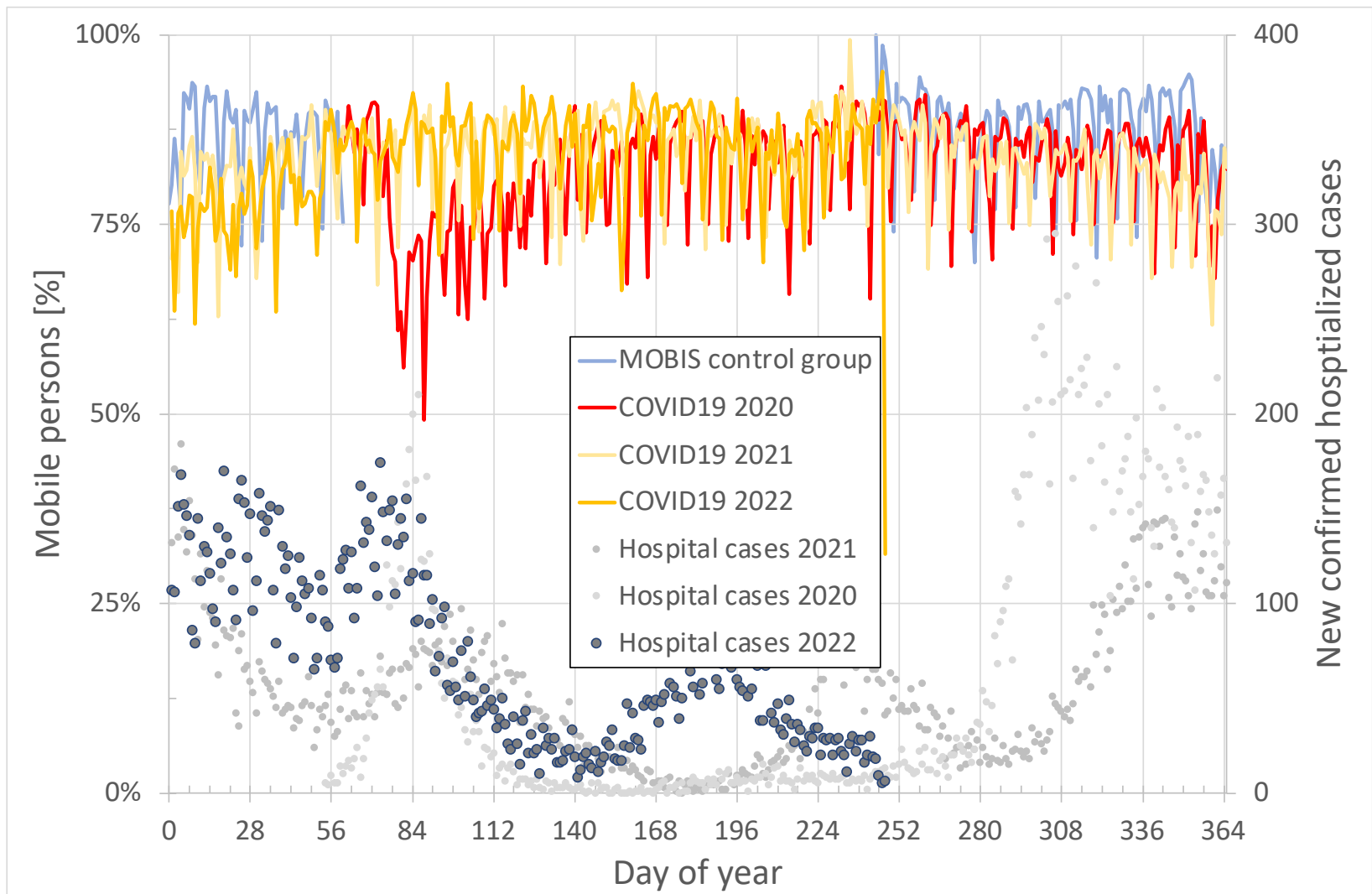
Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zurich



# Prelude: Changability of travel behaviour

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# Share of mobiles September 2019 – June 2022



Source: MOBIS/COVID19 GPS panel

# Dilemma of transport policy

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# Transport

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is a

Normal (private) good

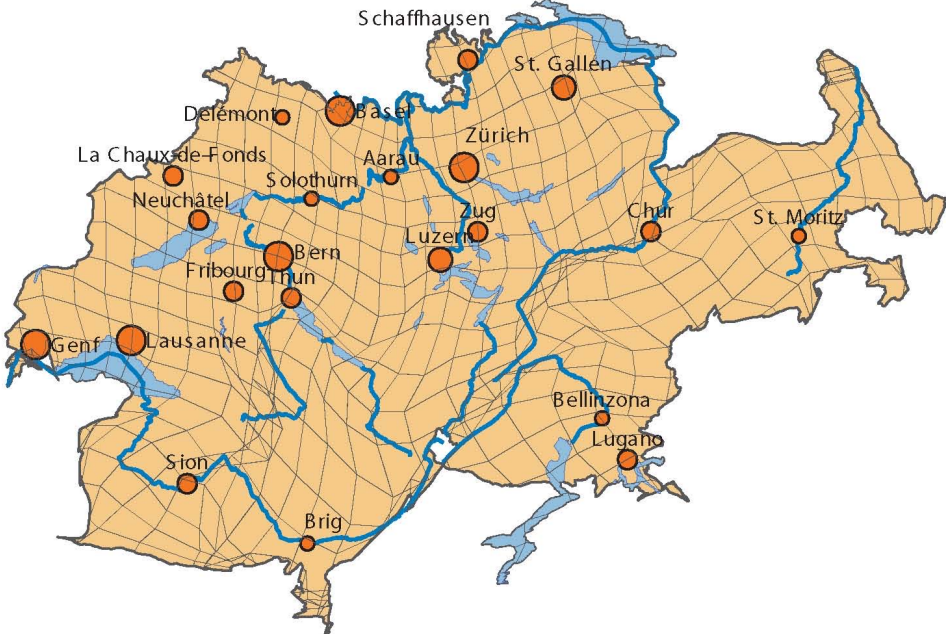
i.e.. it has a negative generalized cost elasticity

# Shrinking “road” – Switzerland (1950)



1 Stunde

# Shrinking “road” – Switzerland (2000)

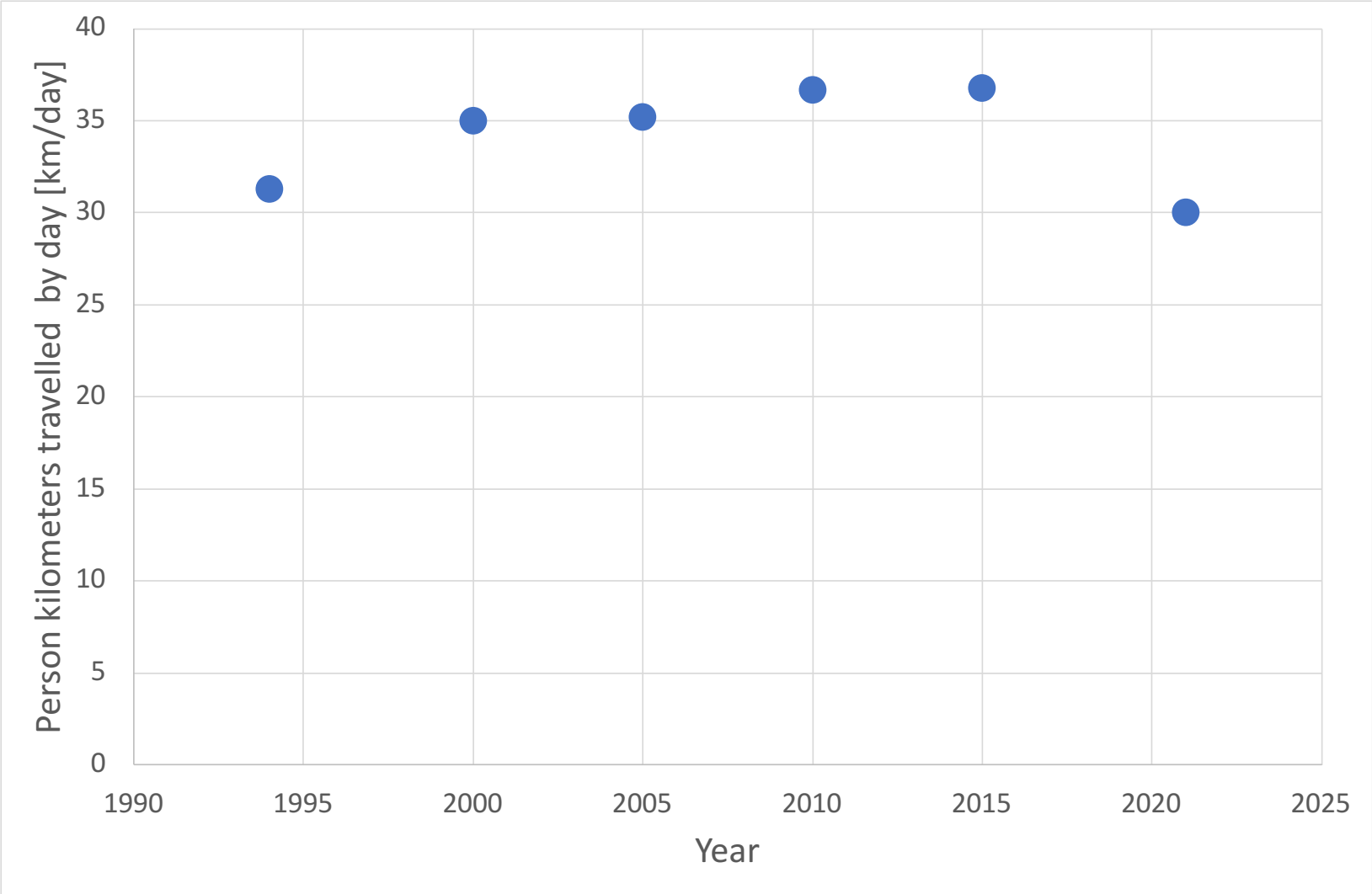


1 Stunde

10km x 10km Raster



# Switzerland: Pkm change since the MZ 1994



# What dilemma ?

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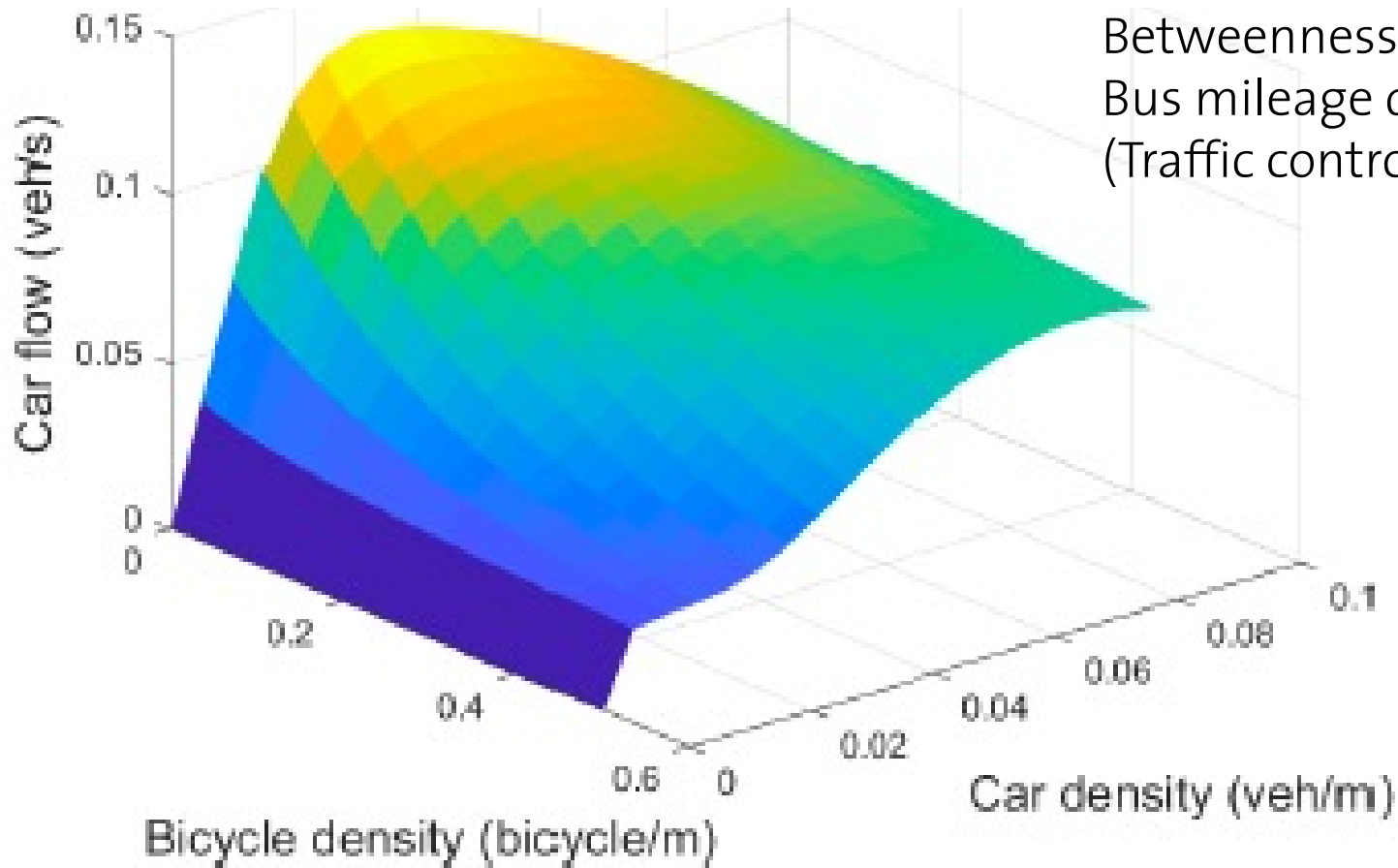
# What dilemma ?

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- Higher accessibility improves productivity and social capital
- Underused unpriced off-peak capacity due to (additional) capacity for population (growth) in the peak (roads, parking, transit) encourages overuse otherwise
- Induced demand due to the lower GC of electric and automated private and public transport
- Working from home making PT less relevant for many
  
- CO<sub>2</sub> reduction requirements
- Sprawl limitations
- VMT growth and congestion

# Nearly fixed urban network capacity =

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Junction density,  
Lane miles density  
Betweenness centrality,  
Bus mileage density  
(Traffic control)

# Which future are we discussing?

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# A managed/co-ordinated one

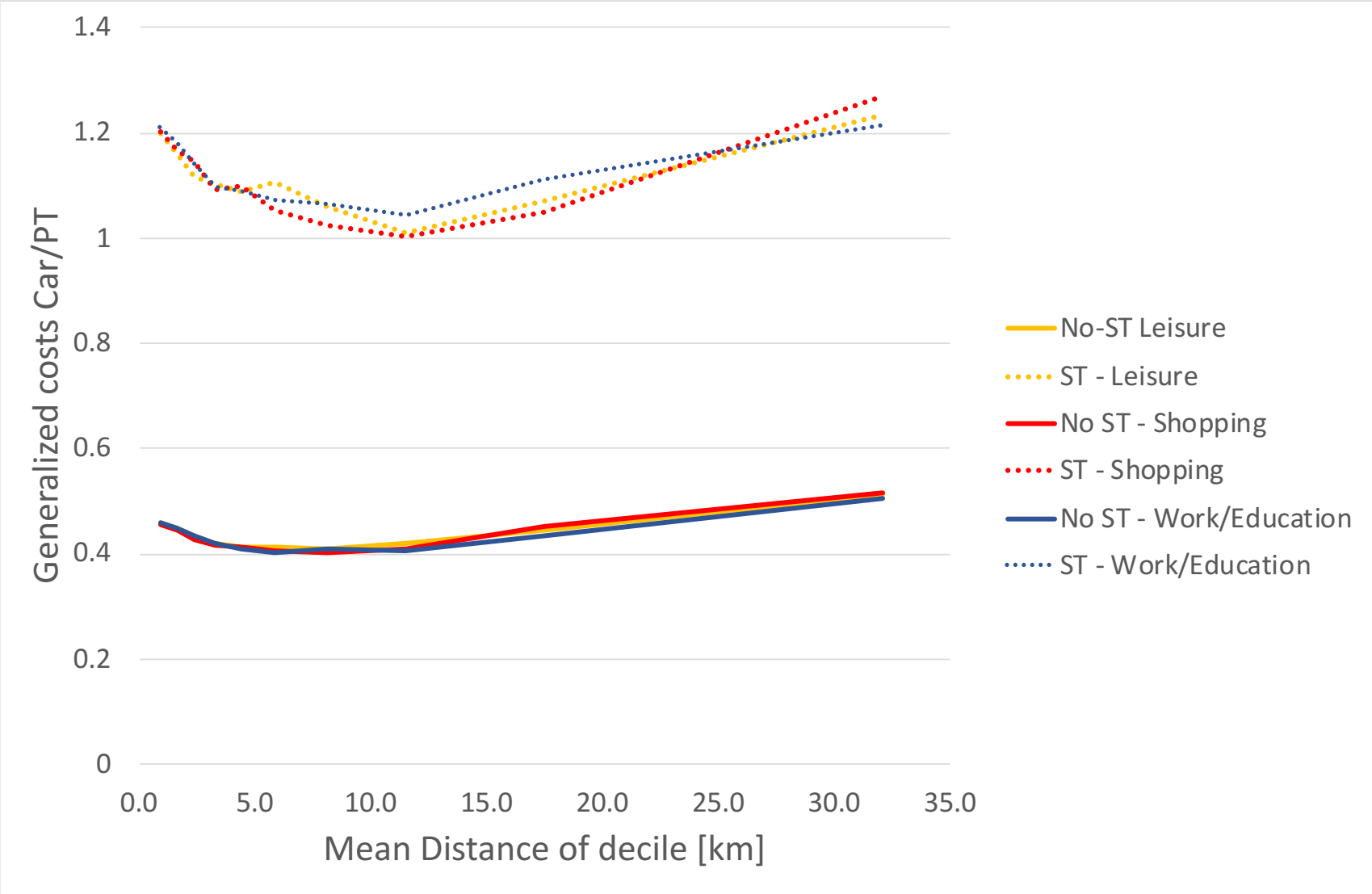
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# A managed/co-ordinated one

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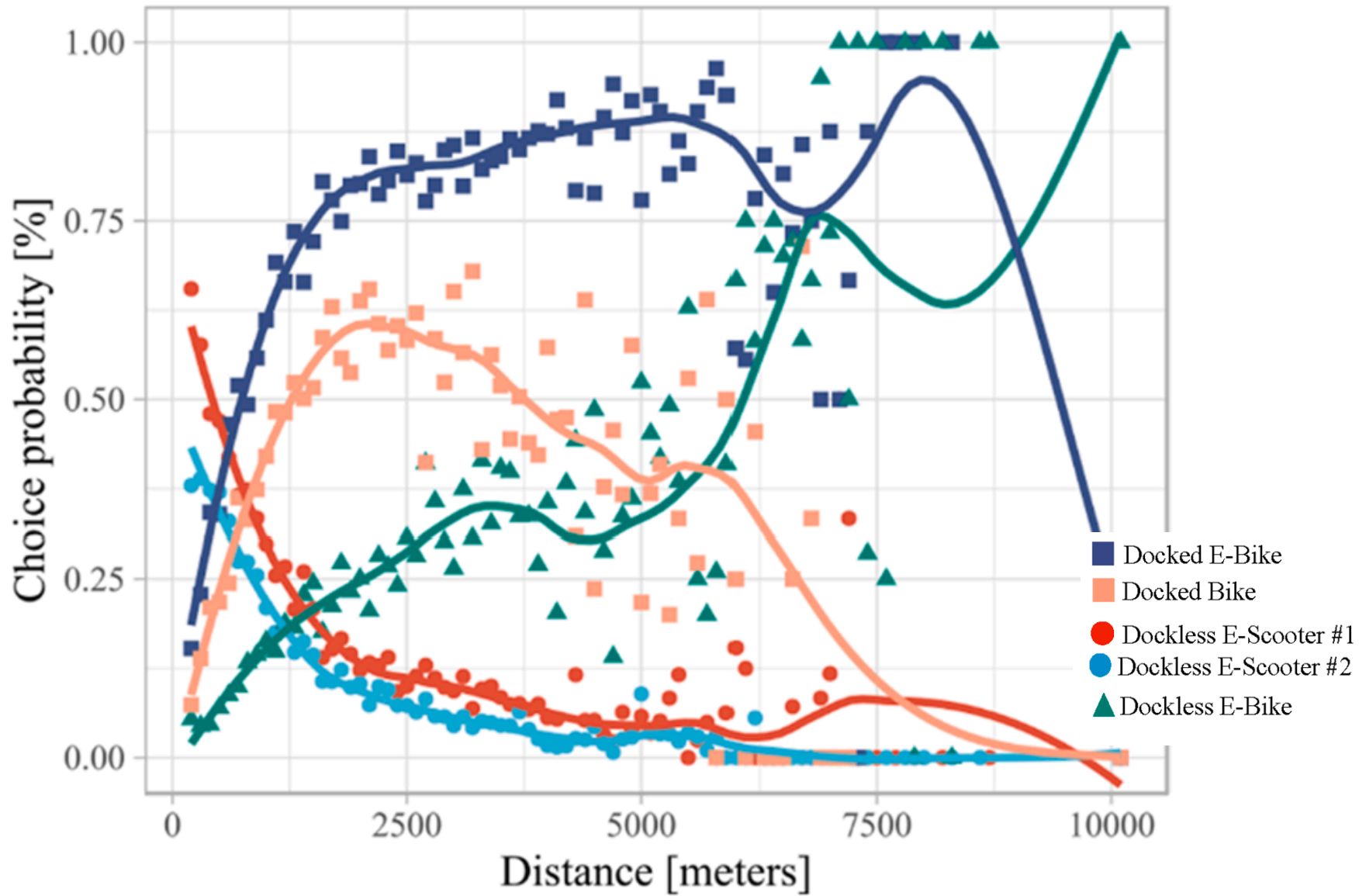
- *Mobility pricing*
  - Two-part tariffs for infrastructure
    - Option fee
    - Pay-as-you-go for usage
  - Congestion pricing
  - (Demand responsive) parking pricing
  - GHG (CO<sub>2</sub>) pricing
  - Local emission pricing
- MaaS improved shared mobility

# A managed/co-ordinated one? Comparison of MOBIS GC





# Microbility use by distance in Zürich

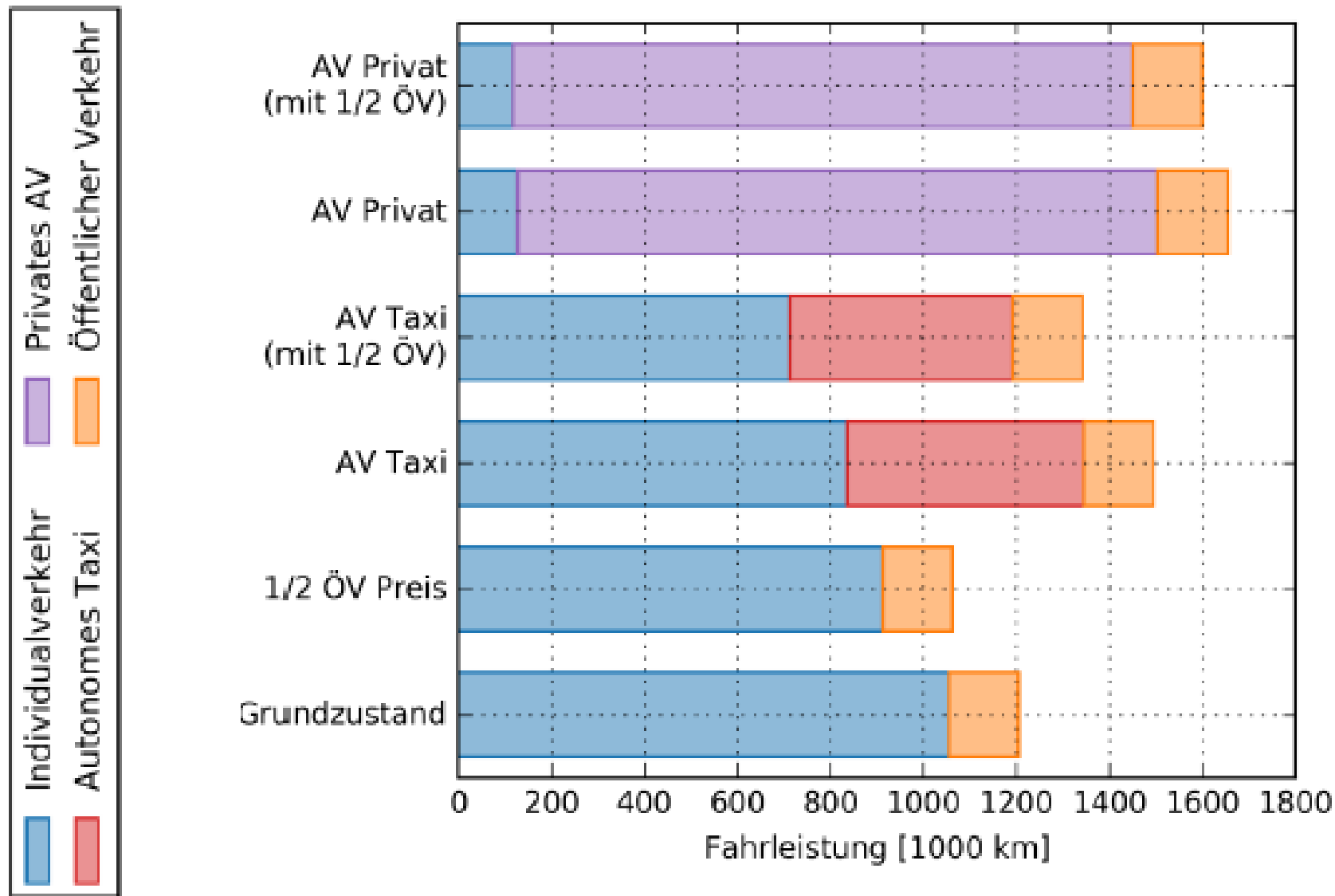


Source: Reck, Guidon, He and Axhausen (2021)

# An automated one?

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# AV in the city of Zürich: VKT changes

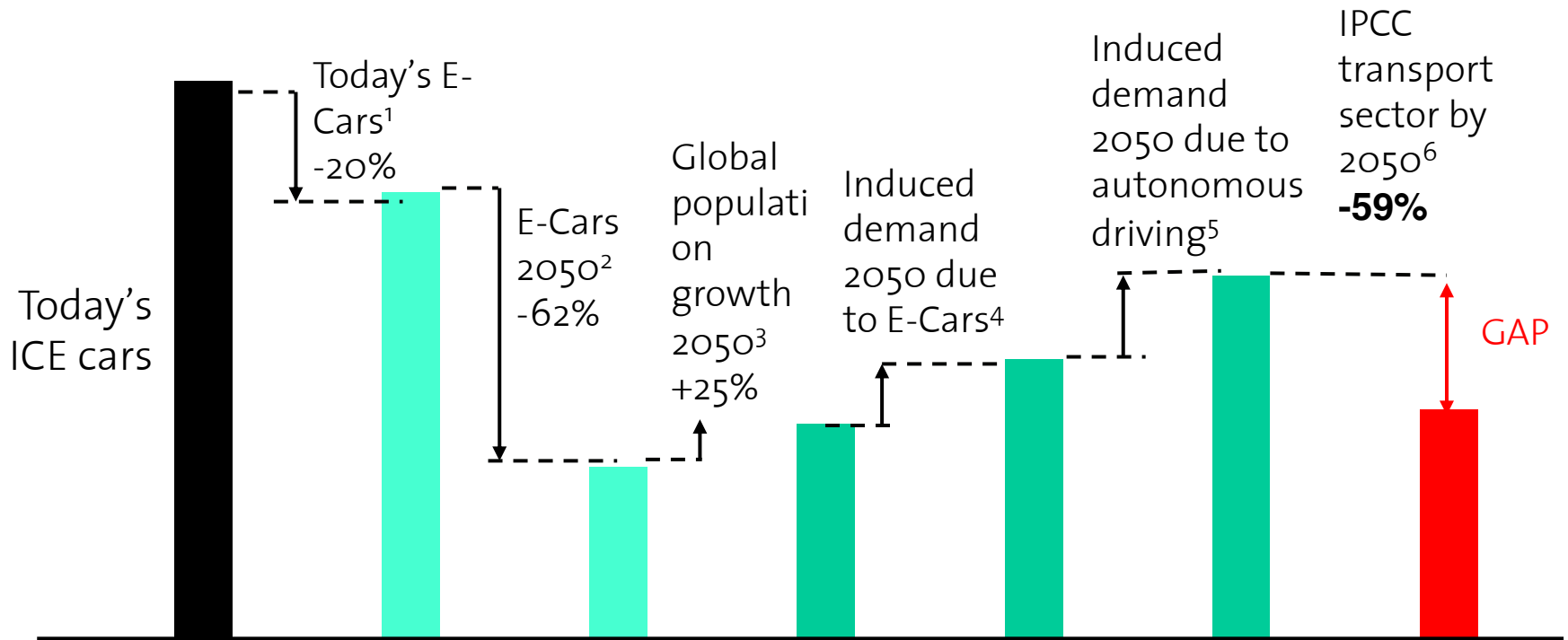


Source: Hörli (2019)

An electrical autonomous one,

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# An electrical autonomous one,



Source: Livingston (2022)

Note: These are optimistic estimates of how many CO<sub>2</sub> emissions can be avoided through technology.

A car free/reduced one,

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# A car free/reduced one,

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- a 15 min city ?
- a net-zero CO<sub>2</sub> city ?
- an e-Bike city ?

# An e-bike city?

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# The idea of an e-bike city

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- 50% of road space for slow vehicles (e-bike, bike etc.)
- Maintaining of current accessibility levels (for all)
- Ensuring emergency and service access
- Integration with shared services for the larger demand variations

# e-bike city team by subproject

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## E-Bike City PIs:

- K.W. Axhausen (C, H)
- M. Bierlaire (EPFL)
- F. Corman (B)
- A.Kouvelas (D)
- *M. Makridis* (D)
- M. Raubal (E)
- S. Hellweg (F)
- D. Kaufmann (G)
- B. Adey (I)

## E-Bike City co-ordinator

- C.V. Livingston

## E-Bike City researchers:

- L. Ballo (C, H)
- F. Fuchs (B)
- C.V. Livingston (C)
- M. Makridis (D)
- A.D. Marra (B)
- H. Martin (E)
- A.H.G. Meister (C)
- L. Meyer de Freitas (H)
- Y-C. Ni (D)
- J. Pougala (EPFL)
- S. Pfister (F)
- V. Schenker (F)
- J. Stephan (G)
- N. Wiedemann (E)
- M. Wiki (G)
- D. Zani (I)

# Questions?

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- [www.ivt.ethz.ch](http://www.ivt.ethz.ch)
- [ebikecity.baug.ethz.ch/](http://ebikecity.baug.ethz.ch/)
- [ebis.ethz.ch/](http://ebis.ethz.ch/)

## Footnotes to slide 30

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<sup>1</sup>ITF (2020) Good to go? Assessing the environmental performance of new mobility, International Transport Forum, Corporate Partnership Board, Paris.

<sup>2</sup>Cox, B., C.L. Mutel, C. Bauer, A. Mendoza Beltran and D.P. van Vuuren (2018) Uncertain environmental footprint of current and future battery electric vehicles, *Environmental Science & Technology*, 52 (8) 4989–4995. – middle of the expected range

<sup>3</sup>UN (2019) World urbanization prospects: The 2018 revision, United Nations, Department of Economic and Social Affairs, Population Division, New York.

<sup>4</sup>Assumption due to growing wealth, better infrastructure and lower cost of batteries for future E-Cars: Schmidt, O., A. Hawkes, A. Gambhir and I. Staffell (2017) The future cost of electrical energy storage based on experience rates, *Nature Energy*, 2 (8) 17110.

<sup>5</sup>Assumption based on Bösch, P.M., F. Ciari and K.W. Axhausen (2018) Transport policy optimization with autonomous vehicles, *Transportation Research Record: Journal of the Transportation Research Board*, 2672 (8) 698–707.

<sup>6</sup>IPCC (2022) Climate change 2022, mitigation of climate change, summary for policymakers, Intergovernmental Panel on Climate Change, Geneva.