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

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IVT
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September 2023

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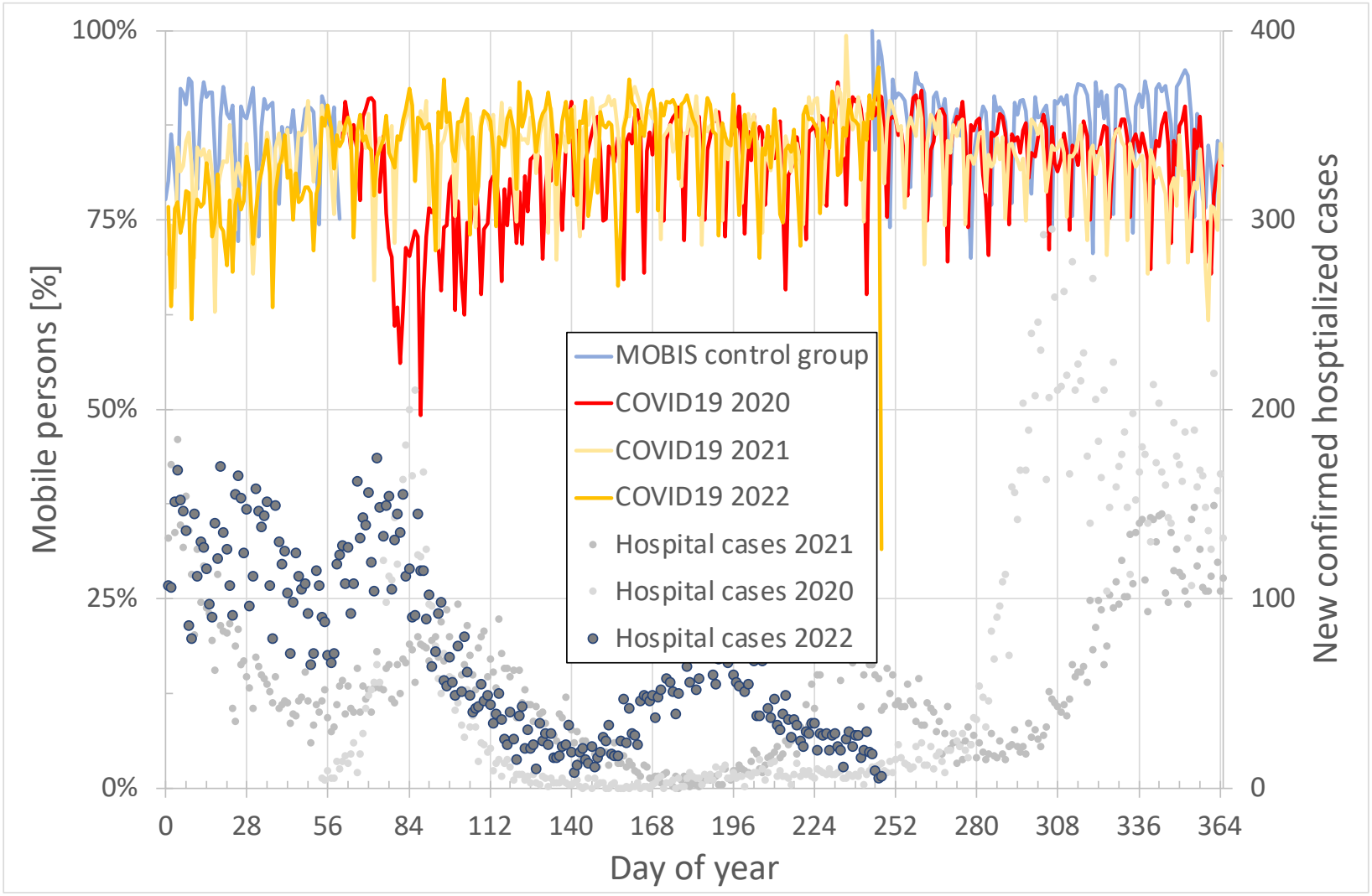
Swiss Federal Institute of Technology Zurich

Prelude: Changability of travel behaviour

Share of mobiles September 2019 – June 2022



Source: MOBIS/COVID19 GPS panel

Dilemma of transport policy

Transport

is a

Normal (private) good

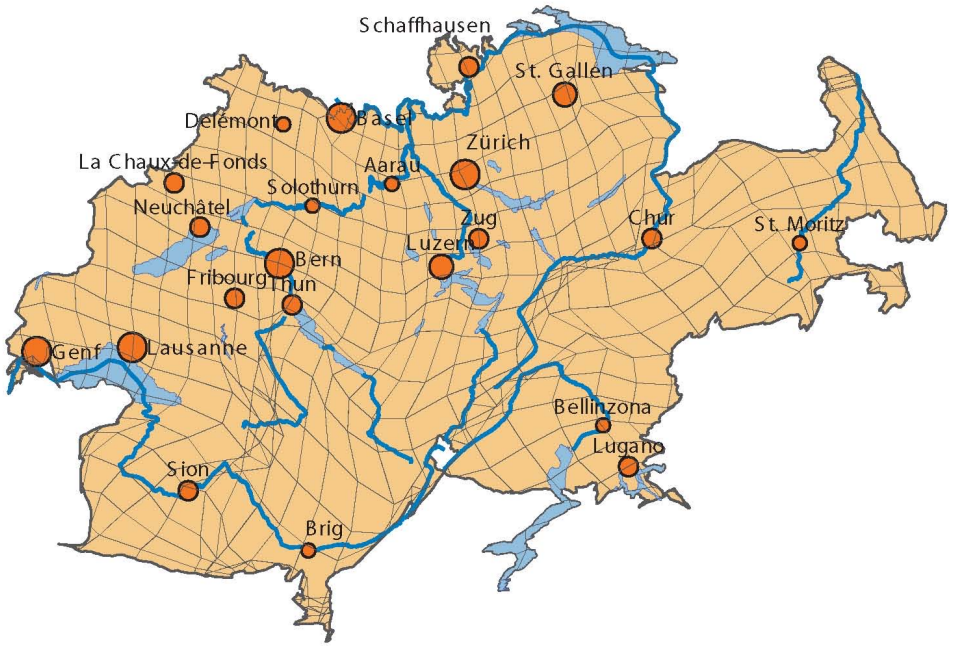
i.e.. it has a negative generalized cost elasticity

Shrinking "road" – Switzerland (1950)

Expert group 23/09 10km x10km Raster

Scherer, 2004

Shrinking "road" – Switzerland (2000)

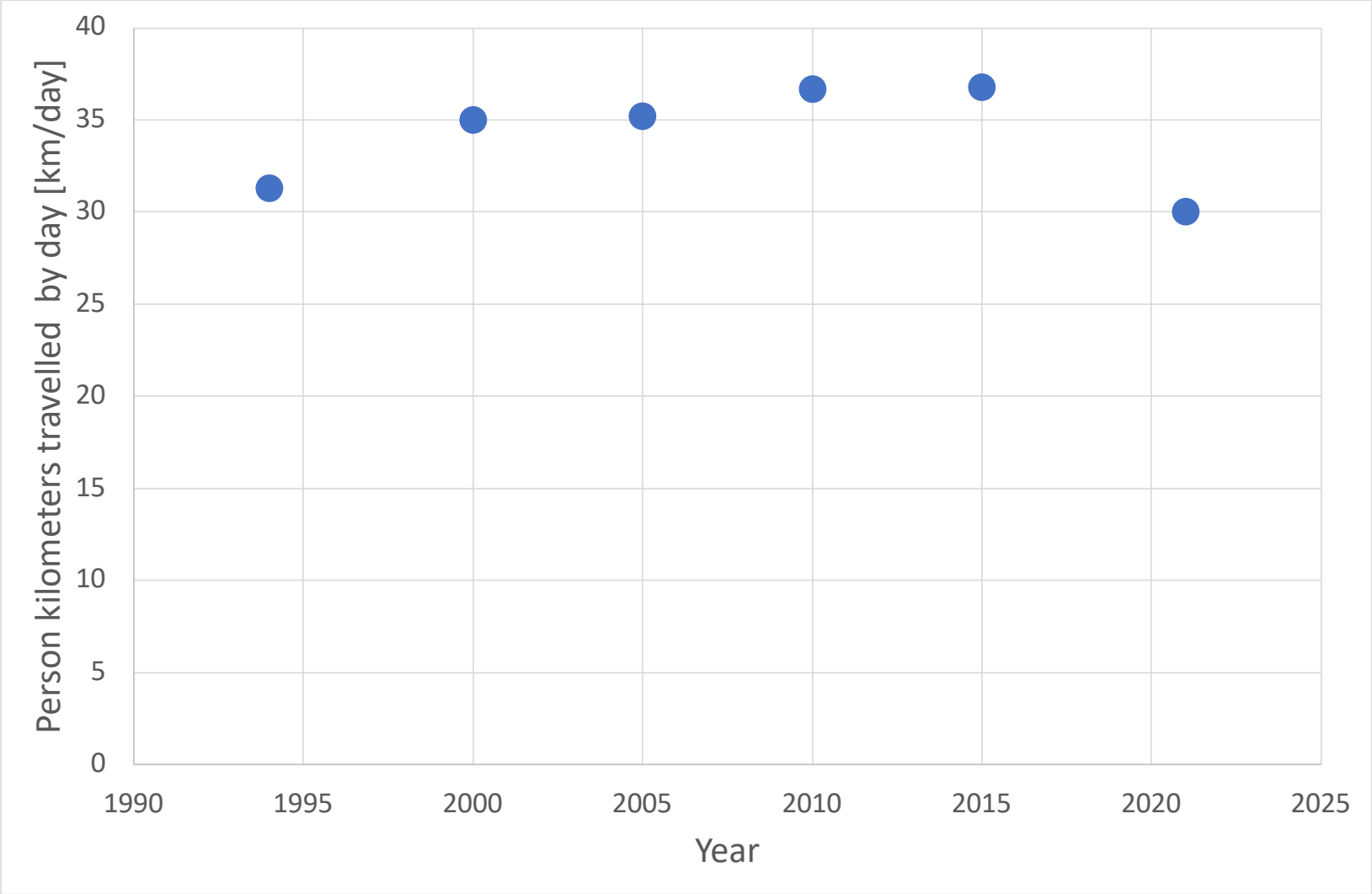


1 Stunde

10km x 10km Raster

Scherer, 2004

Switzerland: Pkm change since the MZ 1994



What dilemma ?

What dilemma ?

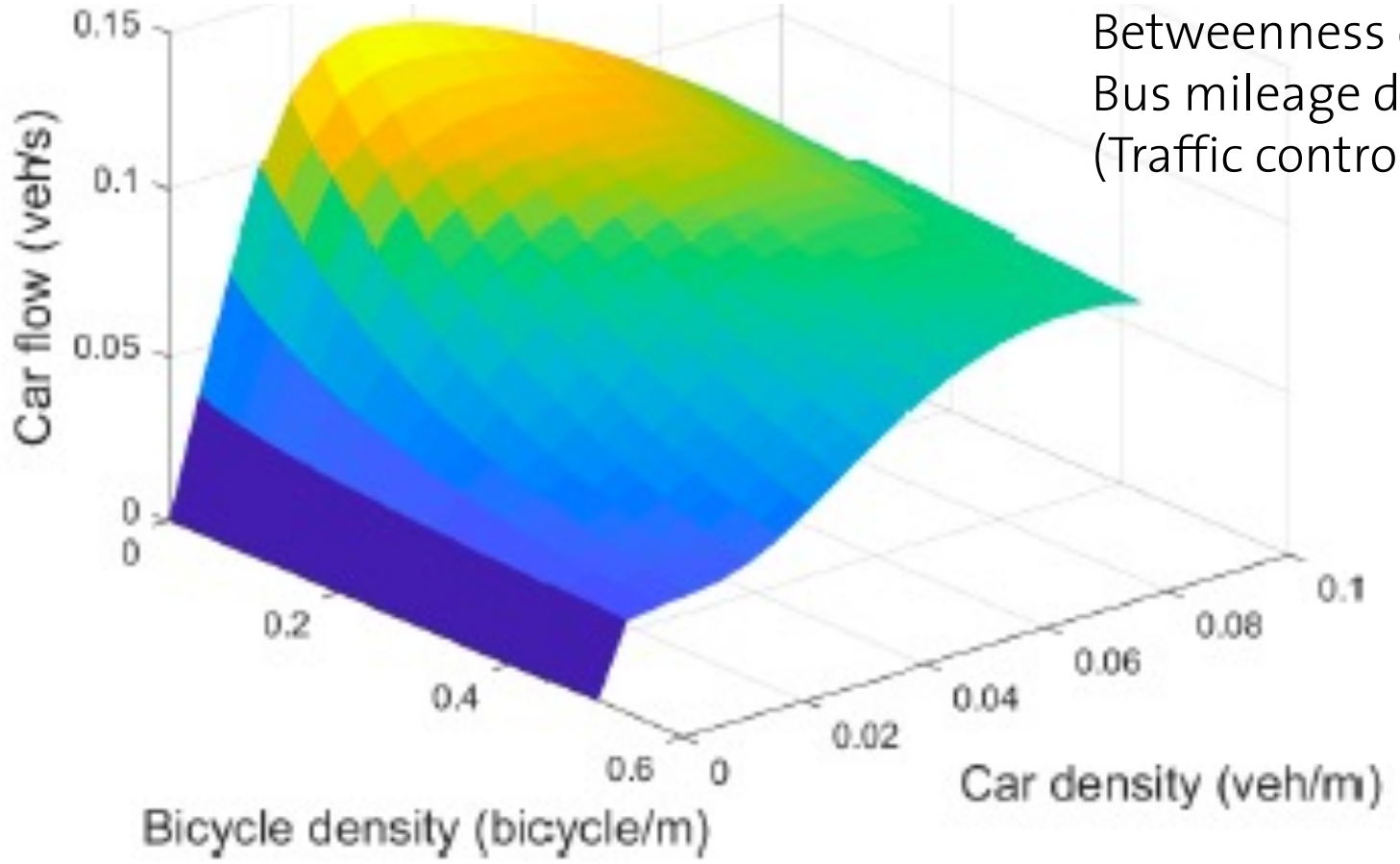
- Higher accessibility improves productivity and social capital

- 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_2 reduction requirements
- Sprawl limitations
- VMT growth and congestion

Nearly fixed urban network capacity =

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



Which future are we discussing?

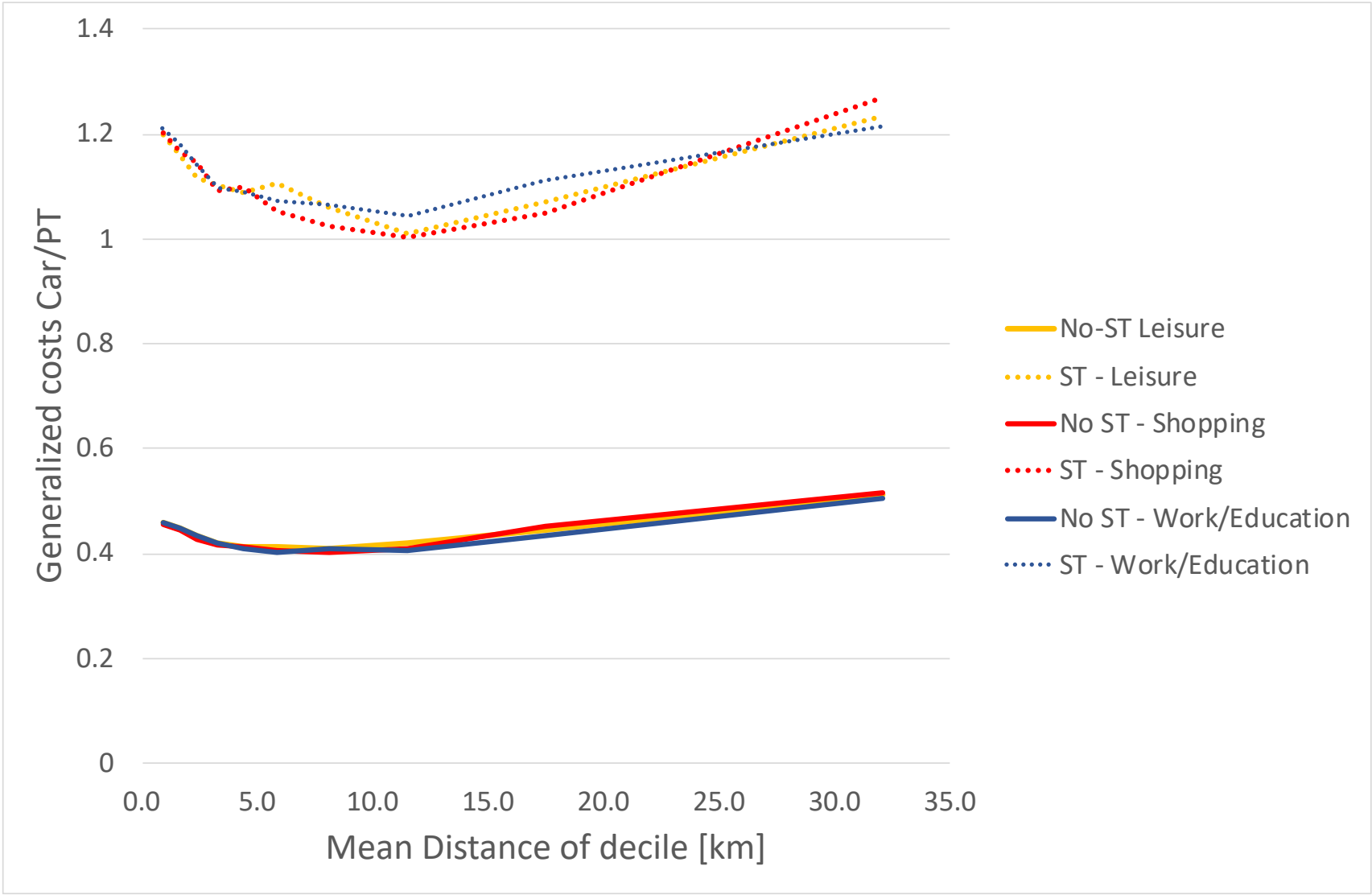
A managed/co-ordinated one

A managed/co-ordinated one

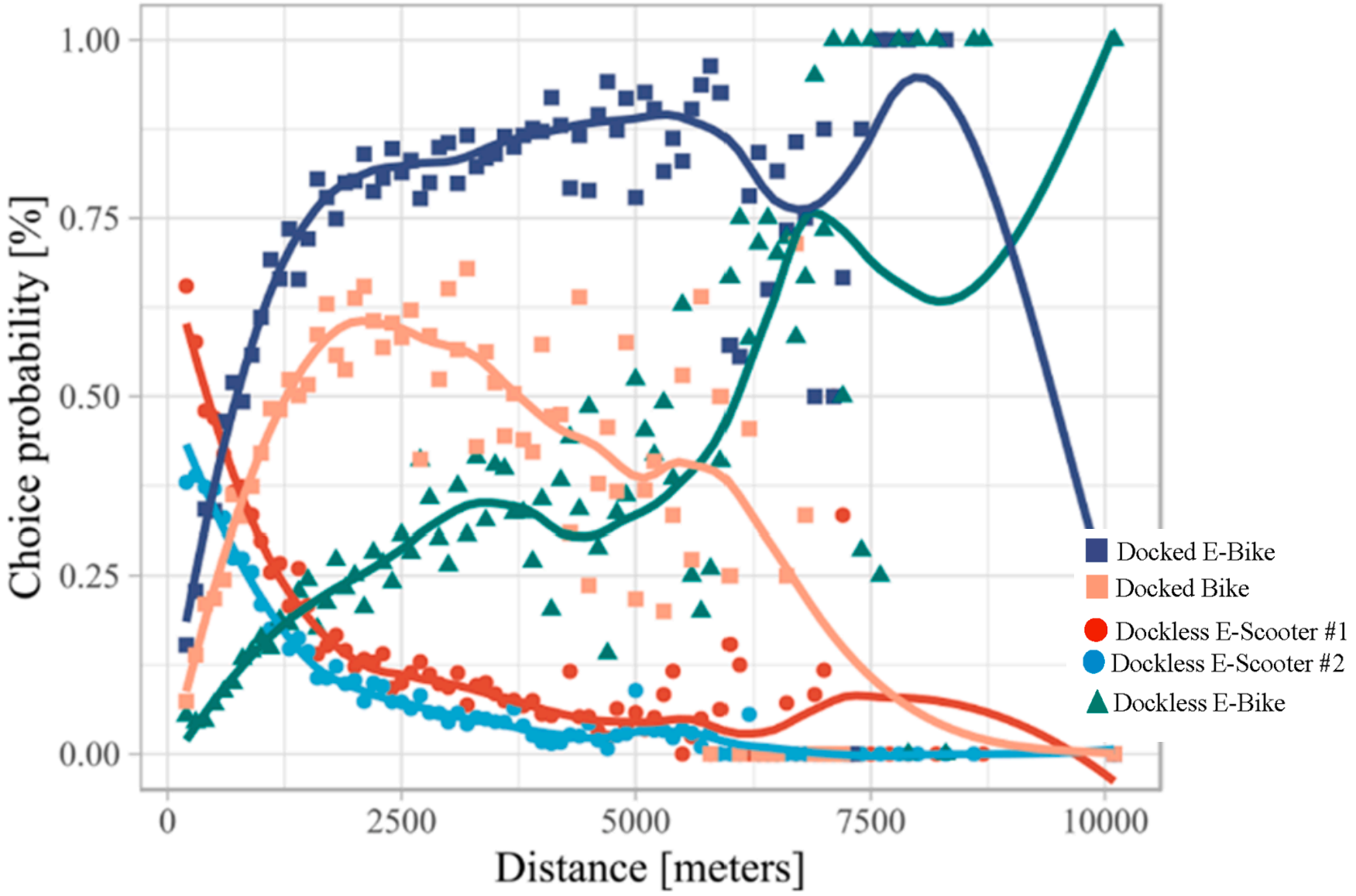
- *Mobility pricing*
  - Two-part tariffs for infrastructure
    - Option fee
    - Pay-as-you-go for usage
  - Congestion pricing
  - (Demand responsive) parking pricing
  - GHG (CO_2) pricing
  - Local emission pricing

- MaaS improved shared mobility

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



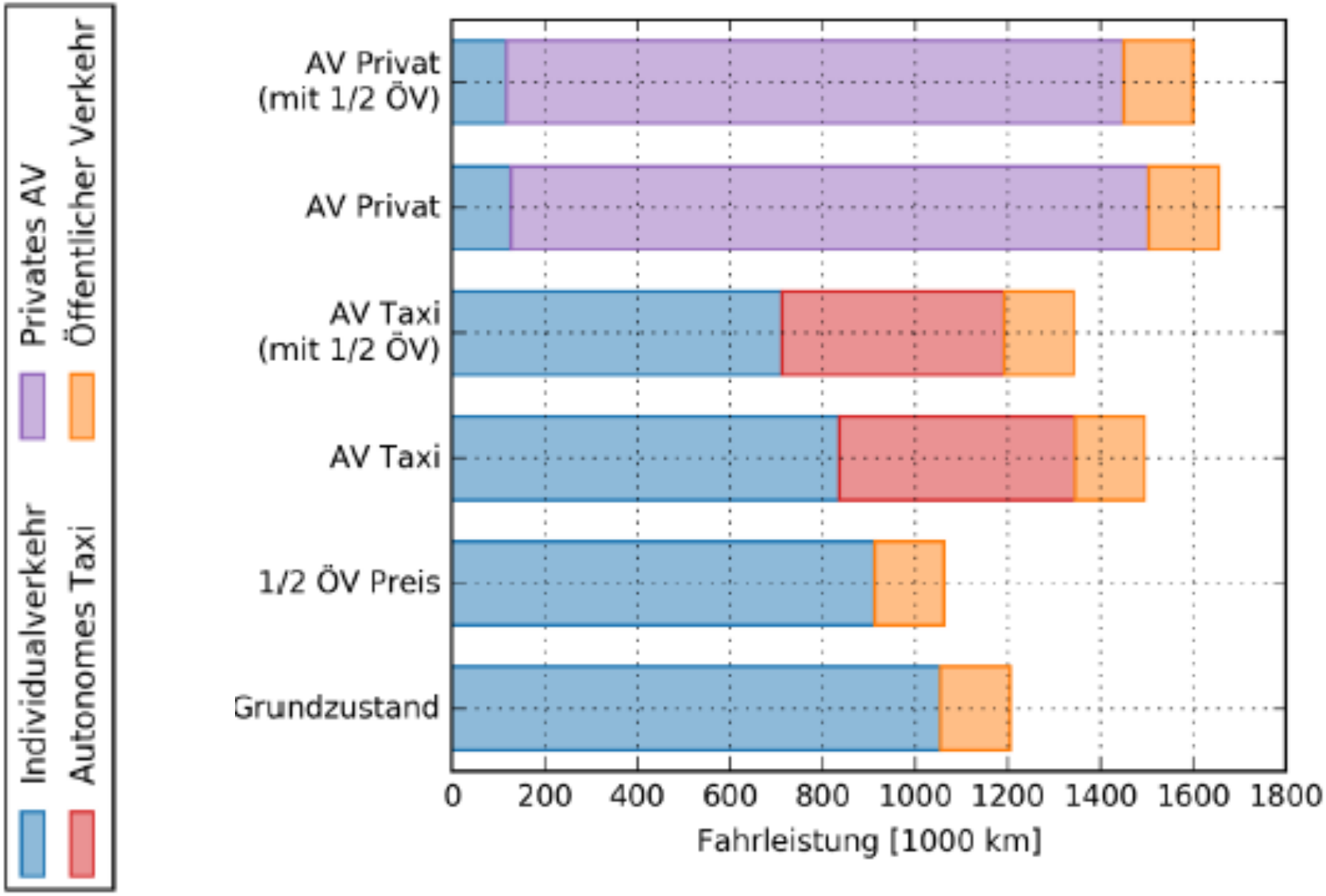
Microbility use by distance in Zürich



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

An automated one?

AV in the city of Zürich: VKT changes

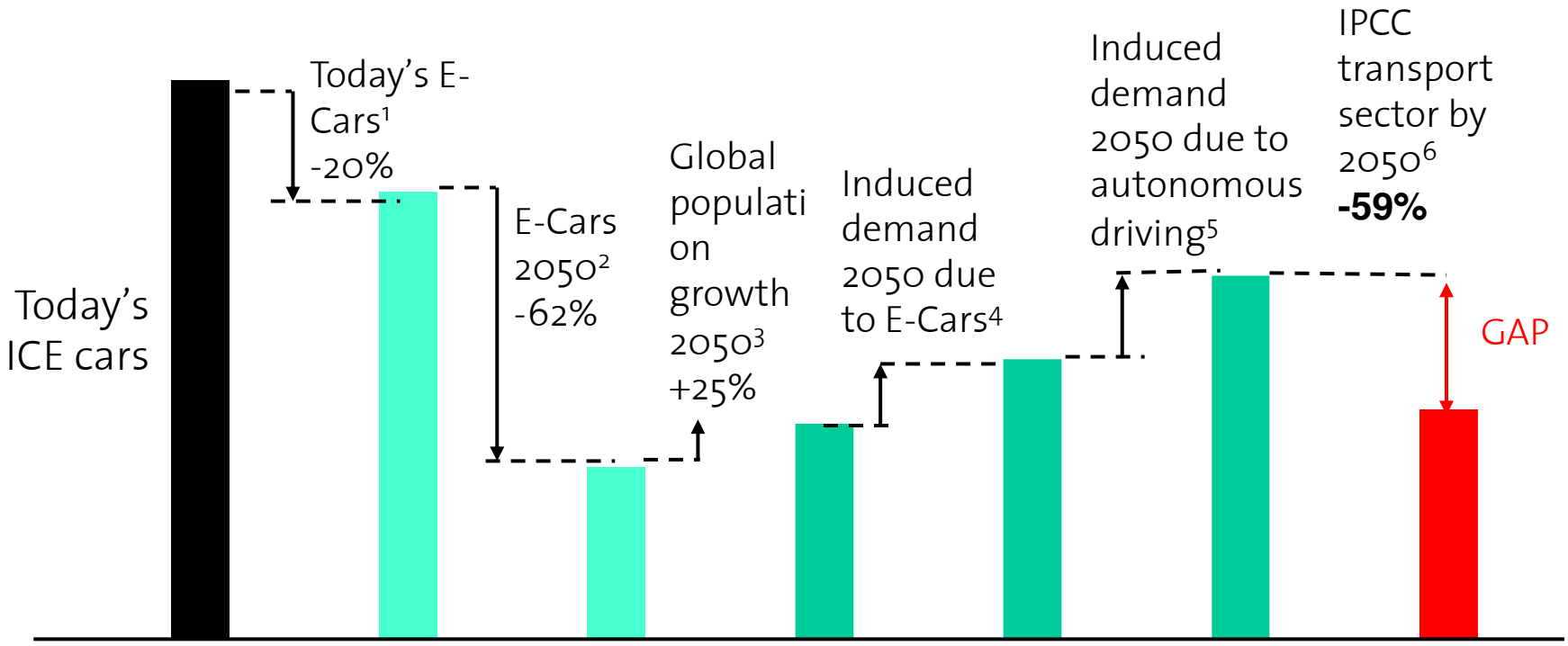


Source: Hörl (2019)

Expert group 23/09

An electrical autonomous one,

An electrical autonomous one,



Source: Livingston (2022)

Note: These are optimistic estimates of how many CO_2 emissions can be avoided through technology.

A car free/reduced one,

A car free/reduced one,

- a 15 min city ?
- a net-zero CO_2 city ?
- an e-Bike city ?

An e-bike city?

The idea of an e-bike city

- 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

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?

- www.ivt.ethz.ch
- ebikecity.baug.ethz.ch/
- ebis.ethz.ch/

Footnotes to slide 30

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

[2] 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

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

[4]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.

[5]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.

[6]IPCC (2022) Climate change 2022, mitigation of climate change, summary for policymakers, Intergovernmental Panel on Climate Change, Geneva.