SIMULATING POTENTIAL IMPACTS OF COMMONING ACCESSIBILITY PRACTICES ON TRAVEL BEHAVIOUR*

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*In progress

MATSim User Meeting

hEART conference, Espoo

17/06/2024

Kevin Faingnaert, © Dégage
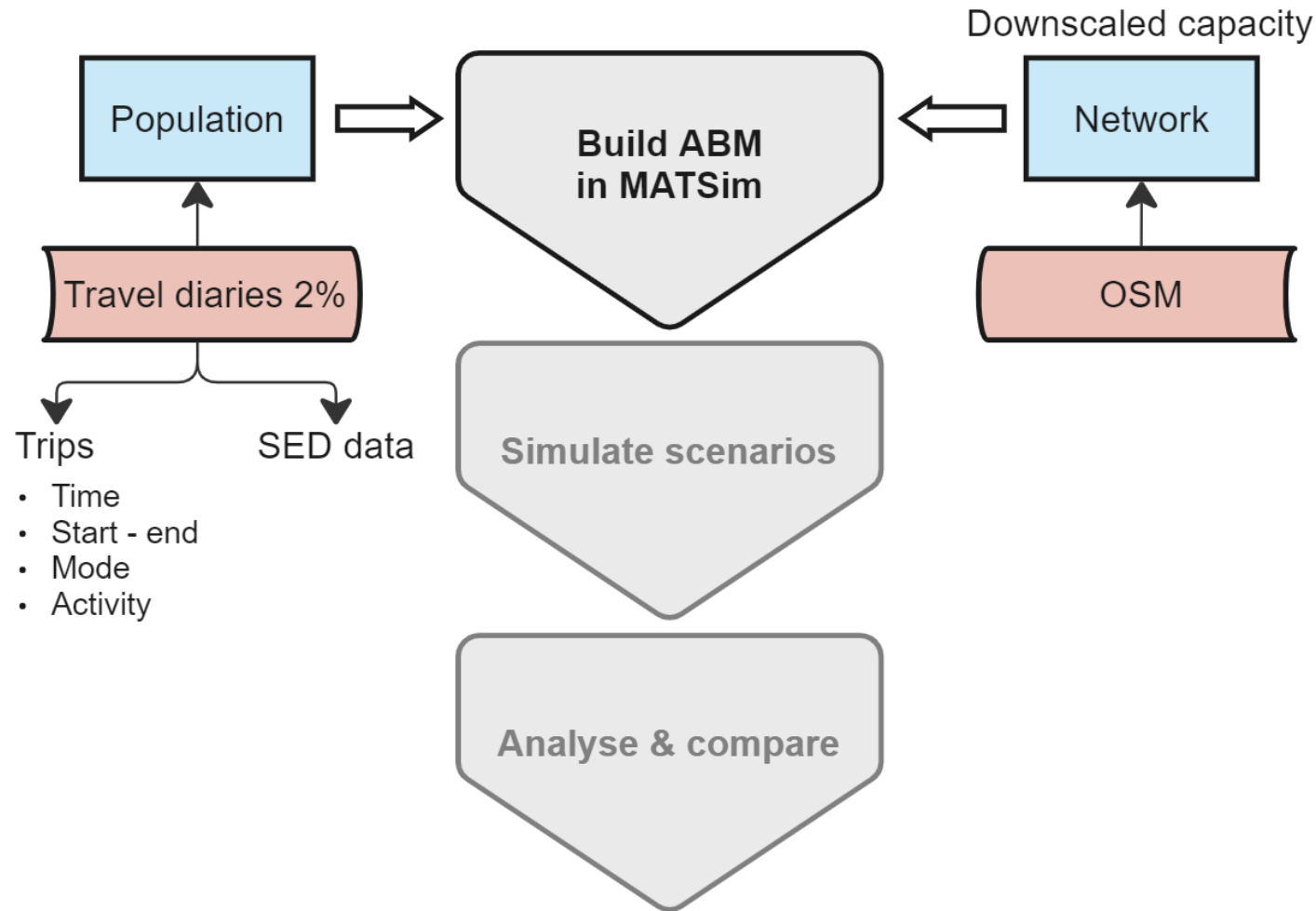
PREVIOUS MATSim WORK

The travel behaviour effects of street closures and shared mobility:
an agent-based simulation approach

Corneel CASIER | Lennert VERHULST | Frank WITLOX
(under revision)

→ Simulation of combined impact of **A) street closures** and **B) shared mobility options**

➢ How are these interventions impacting <u>car traffic flows</u> and where do changes in car traffic volumes occur?

➢ What type of <u>modal shifts</u> can be observed when implementing these interventions?

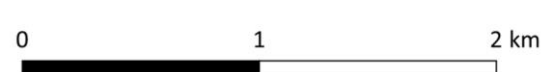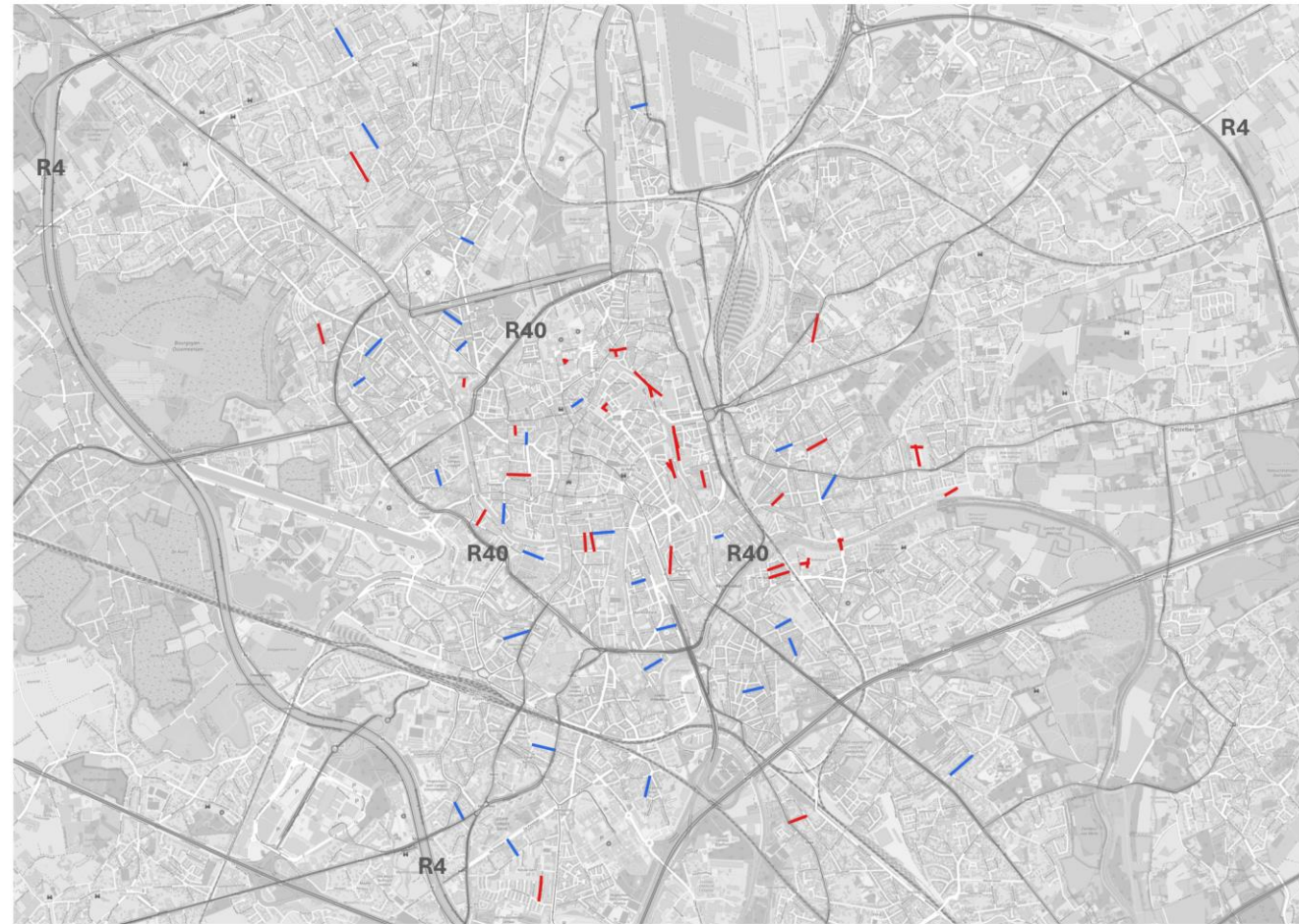➢ Do these effects increase when the interventions are <u>upscaled</u>?

→ EX TRA experimenting with city streets to transform urban mobility

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PREVIOUS MATSim WORK: methodology

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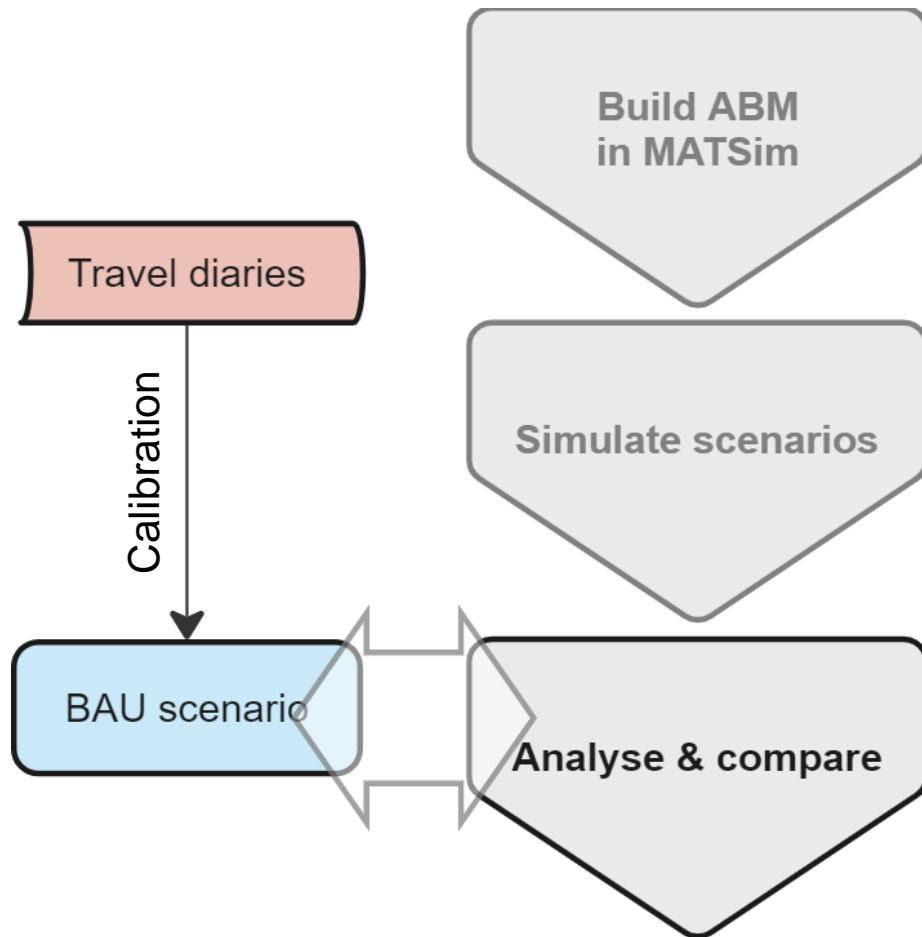0   1   2 km
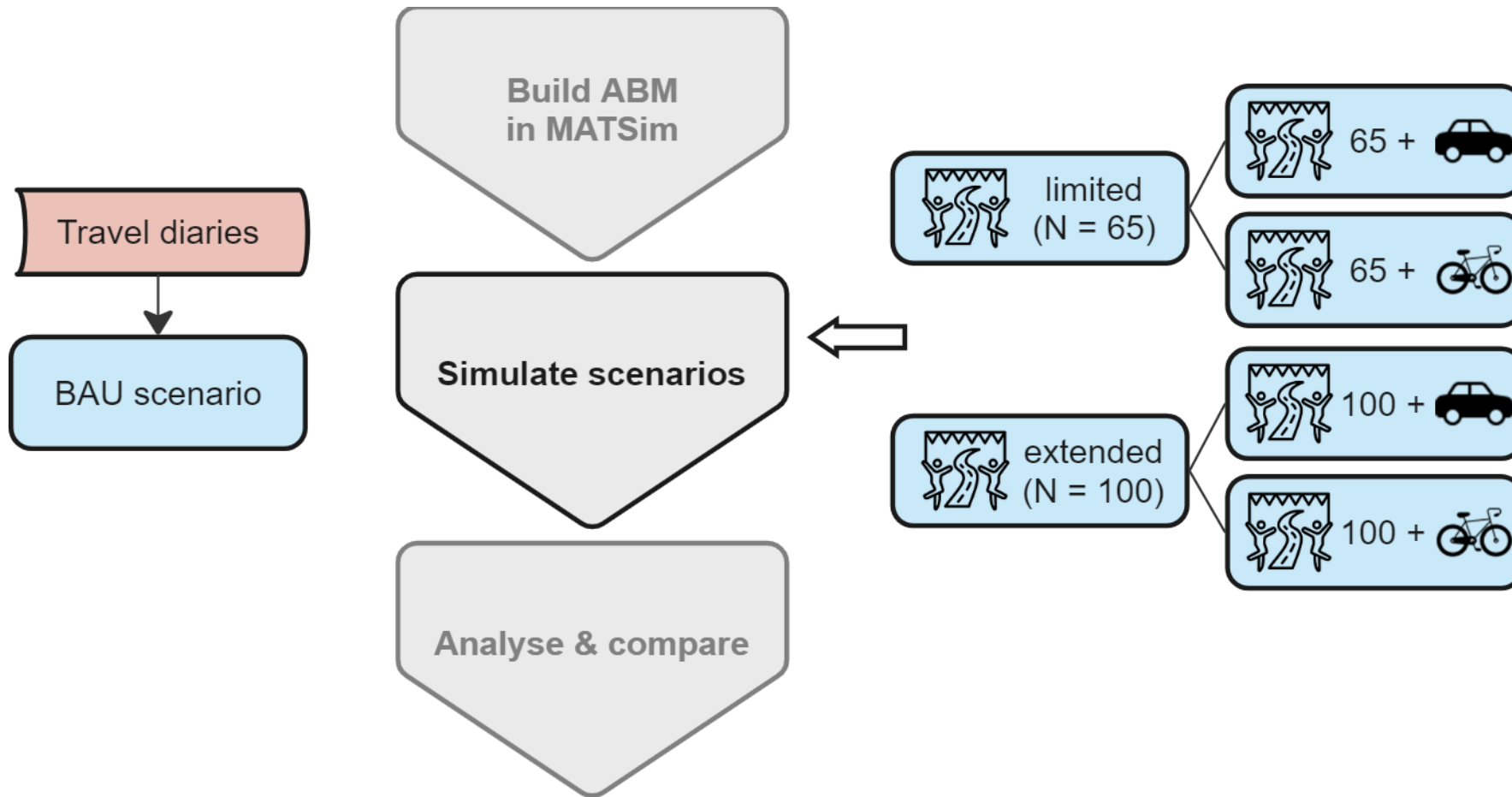
Street closures in SC65-scenario

Additional street closures in SC100-scenario

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PREVIOUS MATSim WORK: methodology

Travel diaries

Calibration

Build ABM in MATSim

Simulate scenarios

BAU scenario

Analyse & compare

Car traffic volumes

GIS-based analysis

Modal splits

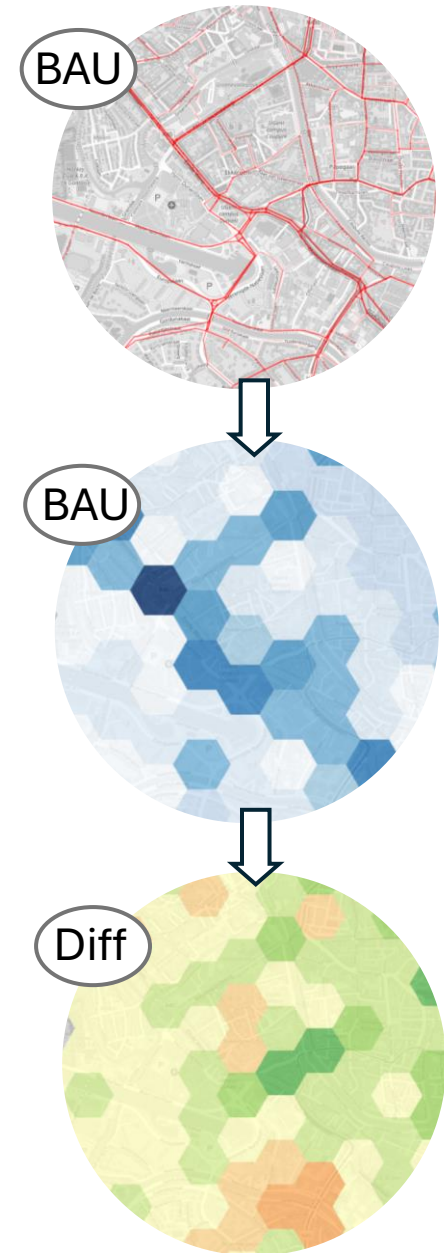MATSim Model output
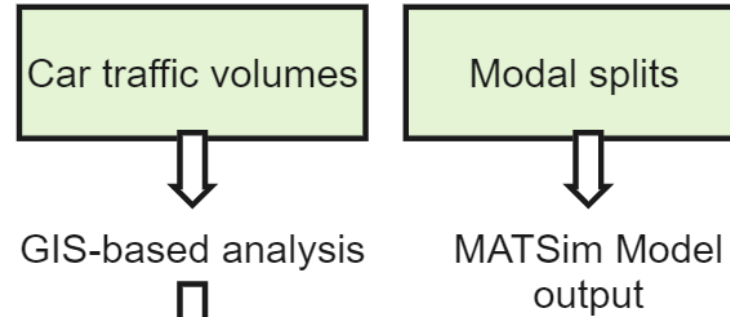
$$V(h) = \sum_{i=1}^{n} q_i$$
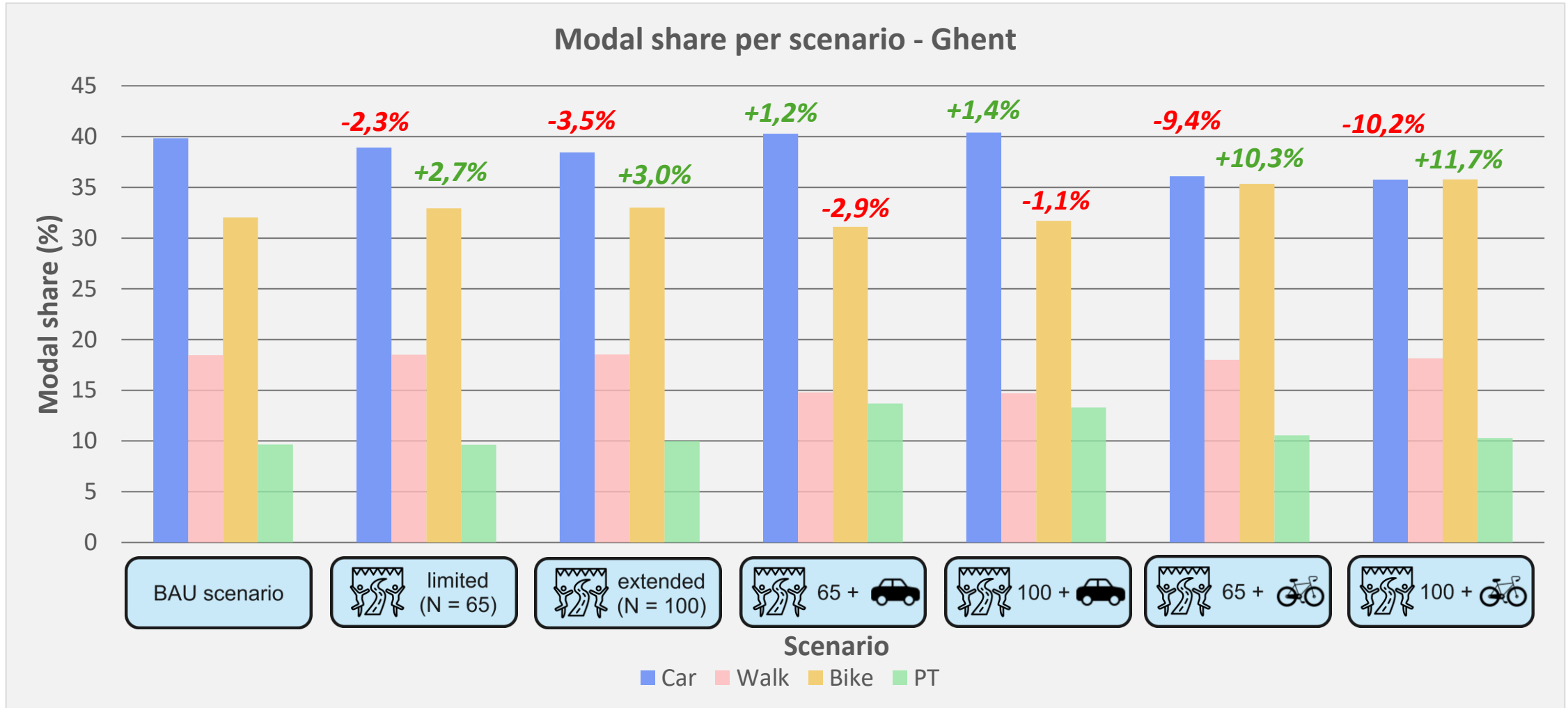
$$Difference(h) = V_{scenario}(h) - V_{BAU}(h)$$

with

q_i = number of vehicles per day on link i

n = number of links in hexagon h

V(h) = Volume of number of vehicles in
        hexagon h per day
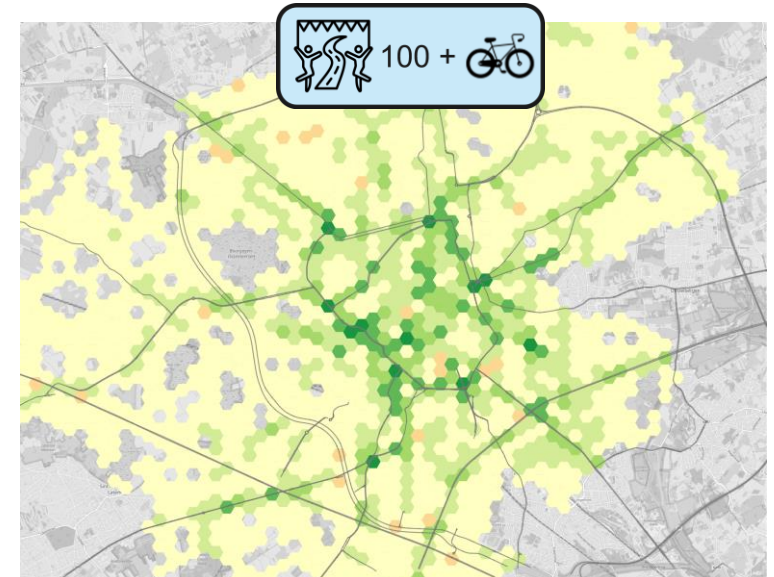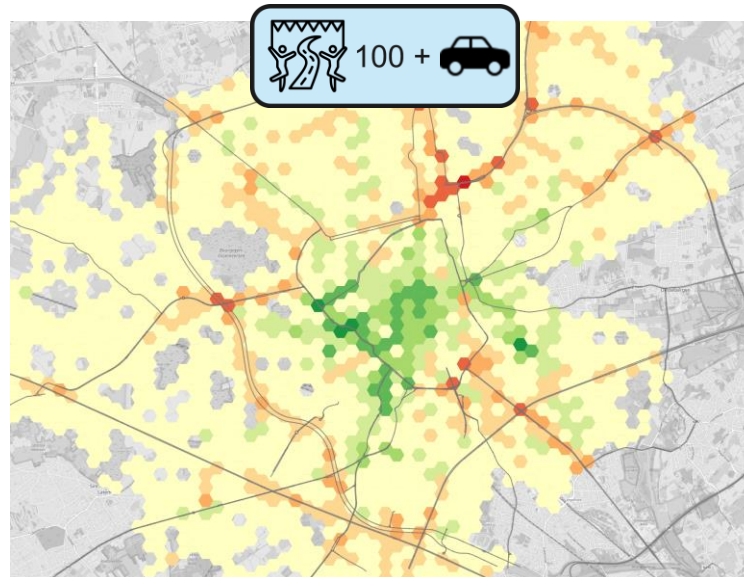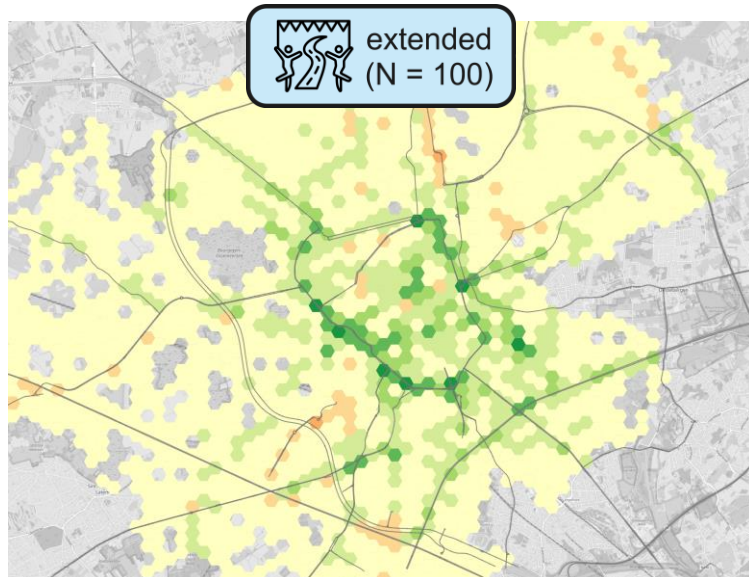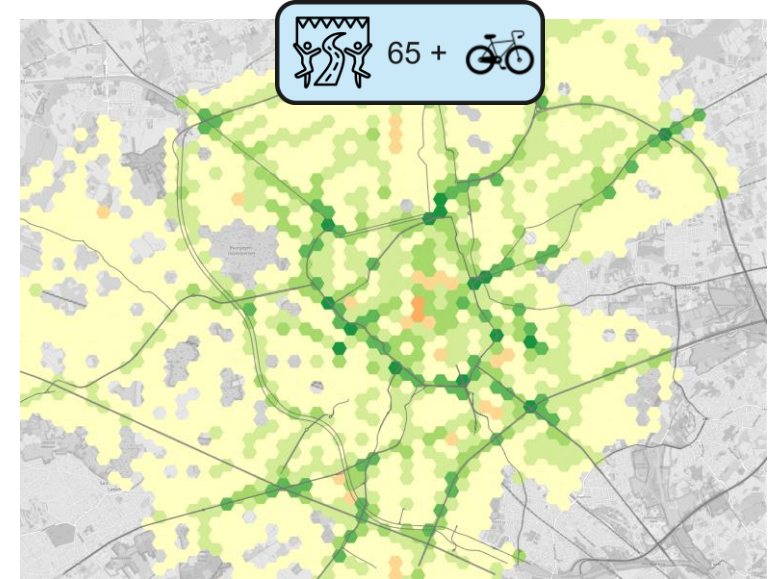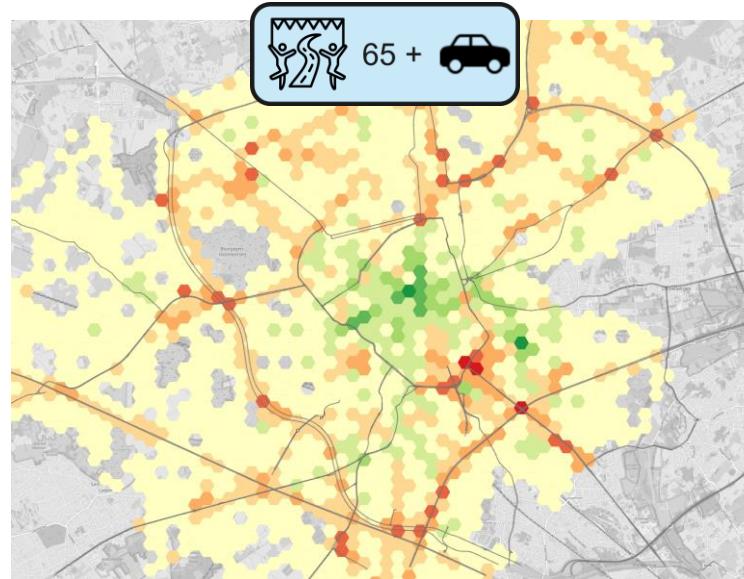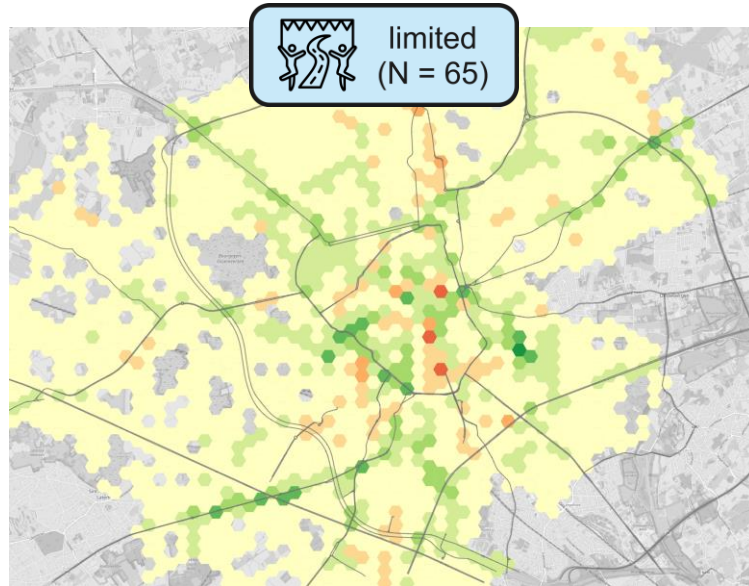
BAU

BAU

Diff

PREVIOUS MATSim WORK: results

Modal share per scenario - Ghent

PREVIOUS MATSim WORK: results

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URBAN EUROPE

PROJECT OBJECTIVE

COMMON_ACCESS, DUT project

Application of 15-min City concept

→Two main barriers

  →(1) Transfer to urban outskirts

  →(2) Lack of attention to social dimension

→Integrating '**commoning accessibility**' (Nikolaeva et al., 2019)

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PROJECT OBJECTIVE: commoning accessibility
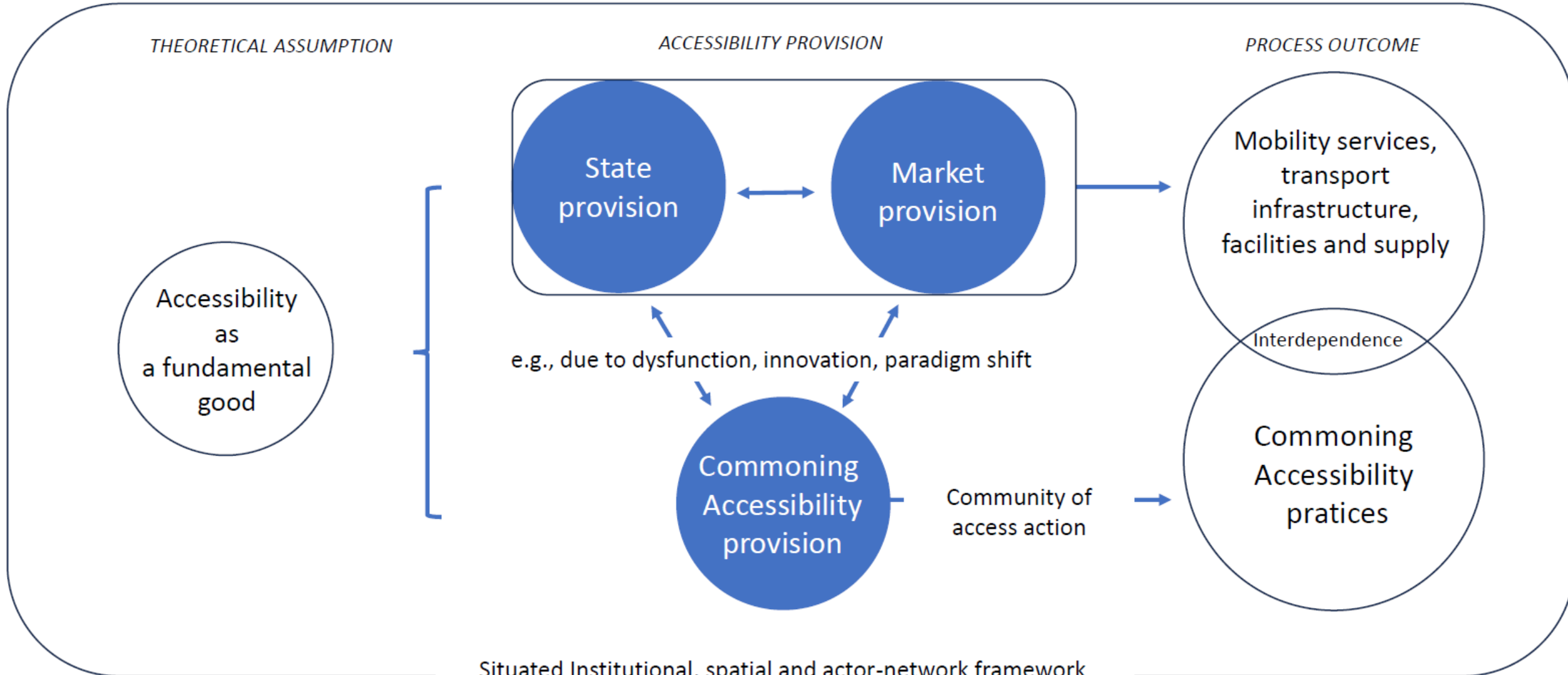
PROJECT OBJECTIVE: commoning accessibility

*"The **process** through which a community collaboratively creates and manages the conditions necessary to **provide access** to needed/desired socio-spatial resources to its **members** under shared rules and norms. This process can either develop as an **alternative** to or in **conjunction** with market/state accessibility provision and is based on the self-empowering capacity of the community"* (Lanza & Pucci, 2024)

PROJECT OBJECTIVE: commoning accessibility practices

*"A set of **actions** that materialize in the **realized access** performed by a community of access, which are both the foundation for the development of the commoning accessibility process and its outcome"* (Lanza & Pucci, 2024)

PROJECT OBJECTIVE: commoning accessibility

Examples

'Transport service scale':
- ➢ Vehicle sharing clubs between neighbours (peer-to-peer)
- ➢ Transport on demand / tailored: e.g. community buses for disabled
    - ➢ Medical transport

Smaller scale:
- ➢ Lending services: e.g. children's bicycles
- ➢ Traffic circulation: parents/teachers at school crossovers
- ➢ Grocery shopping for community/neighbours
- ➢ Jogging in group
- ➢ Carpooling

Other examples:
- ➢ Cycling activation/stimulation programme: e.g. Ring-ring in Amsterdam
- ➢ Mobile libraries

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RESEARCH OBJECTIVE

➢ Estimating impact of 'commoning accessibility' practices in urban outskirts on **travel behaviour** using ABM with MATSim

   ➢ Assessing user **acceptability** and **acceptance** to 'commoning accessibility' practices in urban outskirts

Case study area: East-Flanders (Belgium), focus on urban outskirts / suburban areas

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MATSIM IMPLEMENTATION

How to translate/operationalise 'commoning accessibility' practices (CAP's) into MATSim?

➢ Differences from 'conventional' shared mobility

- Restricted access (specific type of membership, not just by paying ('community' ~ membership Smaldino et al. (2012) in Ciari et al., (2016))
- Smaller scale → very localised impact, measurable?
- More complex travel and use patterns (not simply 'on demand')
- Complex relation between supply and demand

➢ Which CAP's are we focussing on? Car sharing clubs most convenient
➢ What are the specific research questions related to travel behaviour and CAP's?
  ➢ Which scenarios do we simulate? → should be consistent with 'commoning' idea
  ➢ Increased capacity / membership / availability in underserved areas ?
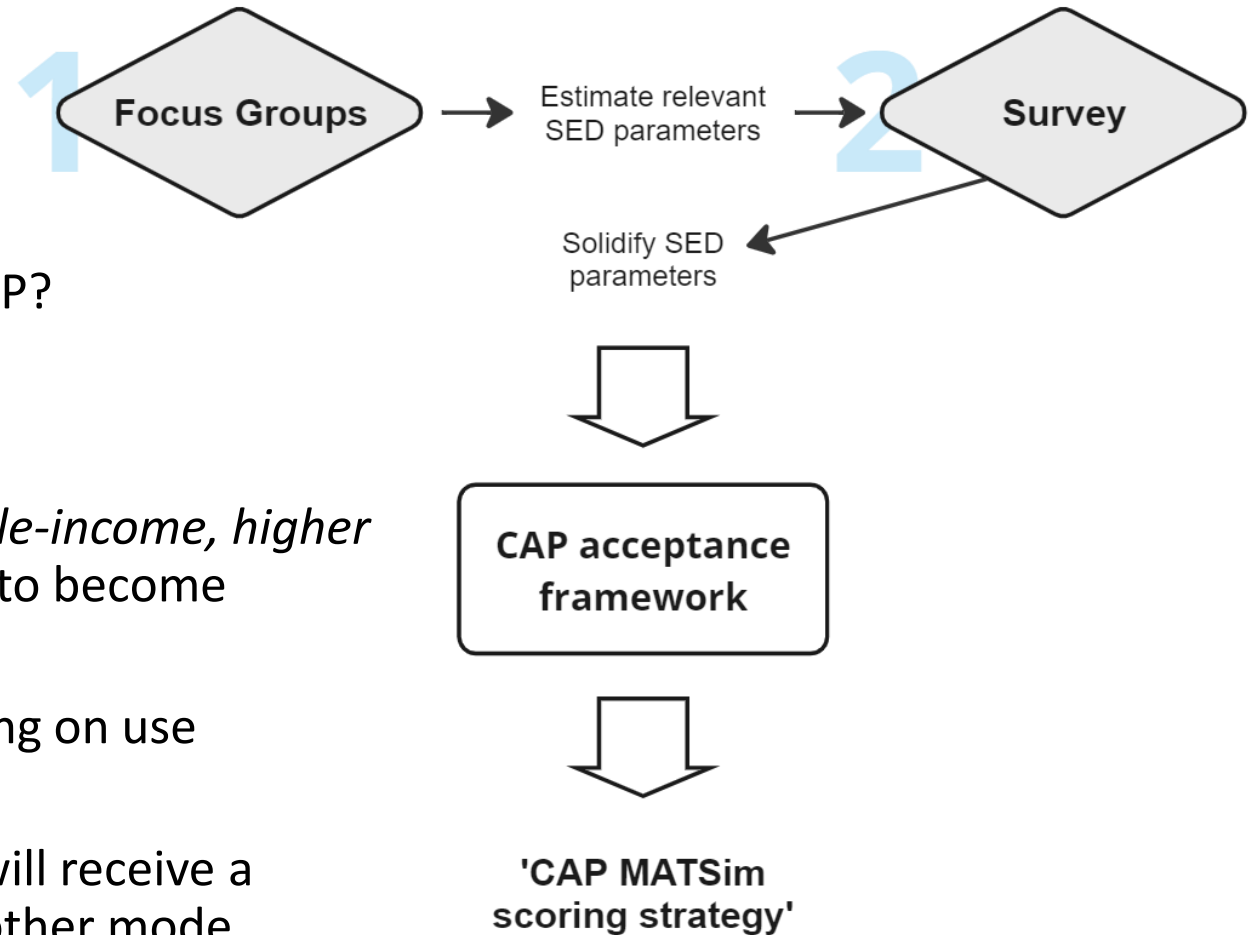➢ On which scales are we analysing impacts?

MATSIM IMPLEMENTATION

CAP Acceptance framework

→ feed-in for MATSim scoring parameters

➢ Which SED factors (or even profiles) give a higher chance for being a member of a CAP?

- e.g. An agent with *no vehicle ownership, middle-income, higher education, and able to telework* is more likely to become member of a CAP and use it

- When is the agent allowed to use it? Depending on use conditions of specific CAP

- When specific vehicle is available, this agent will receive a higher scoring for using CAP instead of using other mode
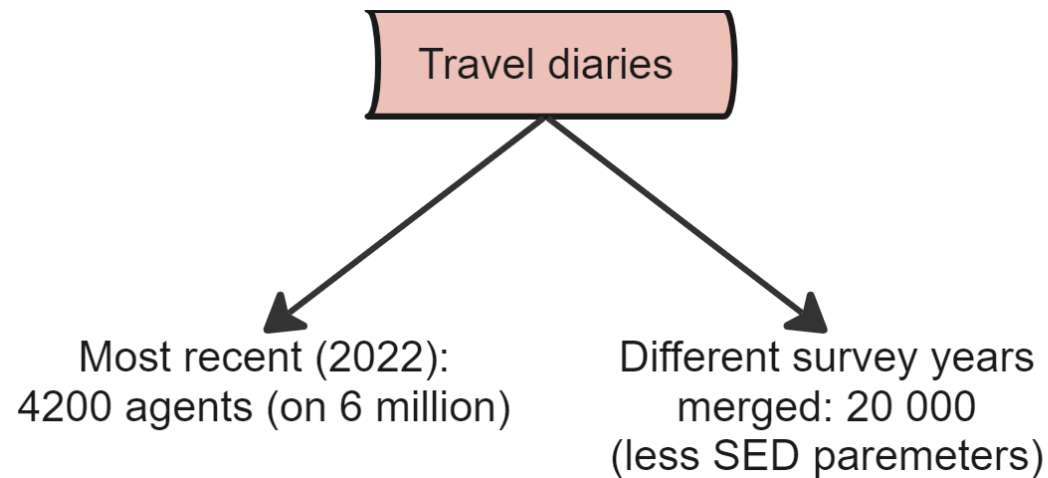
1 Focus Groups → Estimate relevant SED parameters → **2** Survey

Solidify SED parameters ↙

CAP acceptance framework

'CAP MATSim scoring strategy'

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MATSIM IMPLEMENTATION

POPULATION

→ matching acceptance framework to population characteristics

Travel diaries or synthetic?

Travel diaries

Most recent (2022):
4200 agents (on 6 million)

Different survey years
merged: 20 000
(less SED paremeters)

Synthetic pop.

- Census data 2021
- Regional travel behaviour survey (2022)
- ...

→ Feasible for population with many attributes?

REFERENCES

- Ciari, F., Balac, M., & Axhausen, K. W. (2016). Modeling carsharing with the agent-based simulation MATSim: State of the art, applications, and future developments. Transportation Research Record, 2564(1), 14-20.

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- Nikolaeva, A., Adey, P., Cresswell, T., Lee, J. Y., Nóvoa, A., & Temenos, C. (2019). Commoning mobility: Towards a new politics of mobility transitions. Transactions of the Institute of British Geographers, 44(2), 346-360.

- Smaldino, P., Pickett, C., Sherman, J., & Schank, J. (2012). An agent-based model of social identity dynamics. Journal of Artificial Societies and Social Simulation, 15(4).

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THANKS FOR YOUR ATTENTION!

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MATSim User Meeting

hEART conference, Espoo

17/06/2024

Wannes Nimmegeers, 2020