

Preferred citation style for this presentation

Hörl, S. and A. Froemelt (2017) Future scenarios of land-based mobility including autonomous vehicles

Future scenarios of land-based mobility including autonomous vehicles

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30 August 2017

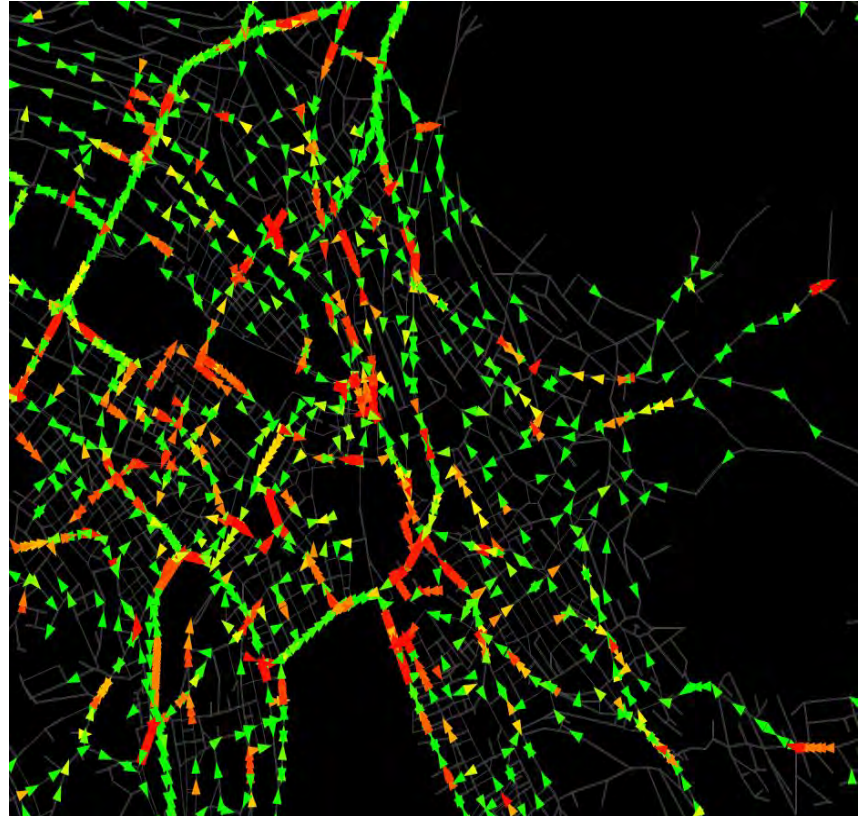
 *Institut für Verkehrsplanung und Transportsysteme*
Institute for Transport Planning and Systems

 **ESD**
ecological systems design

ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Traffic Simulation

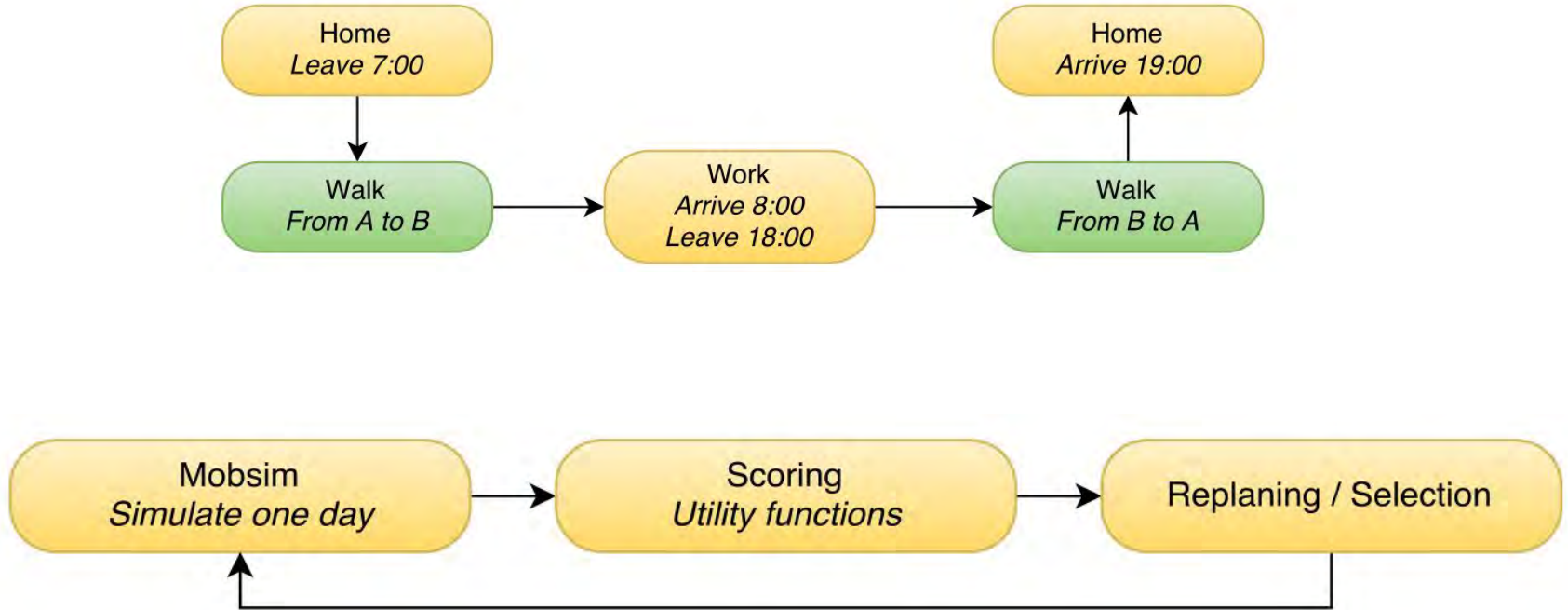


<https://pixabay.com/en/traffic-jam-stop-and-go-rush-hour-143391/>

Senozon VIA

MATSim

Hörl (2016)



MATSim Visualization



Background Map:
OpenStreetMap

Visualization:
Senozon VIA

Moritz Hohenfellner
2017

Autonomous Vehicles

 Access to
Mobility

 Effective
Capacities

 Customer
Prices

vs.

 Individualization

 VKT Increase

 Travel Demand

Net Effect?
Future of public transport?

Autonomous Vehicles

 Access to
Mobility

 Effective
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 VKT Increase

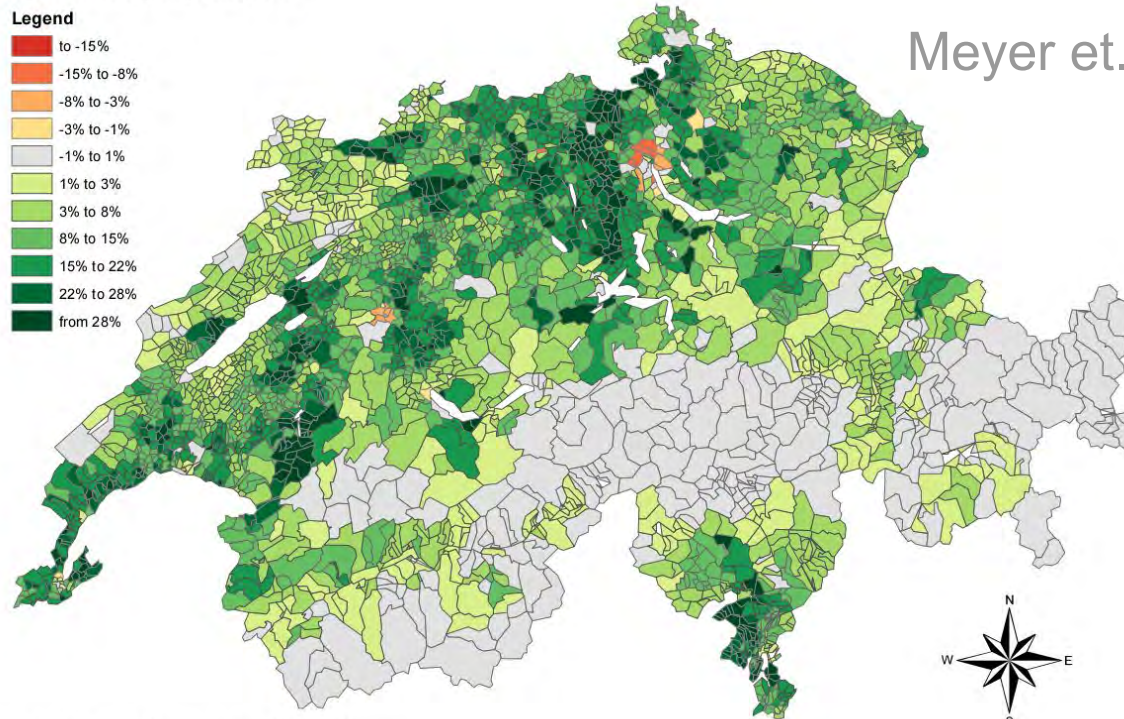
 Travel Demand

Constraints?

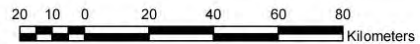
Autonomous Vehicles

Scenario 3 with Induced Demand
Optimistic Capacity Increase

Legend



Meyer et. al, 2017



Autonomous Vehicles in La Défense



Background Map:
OpenStreetMap

Scenario:
Hörl (2017)

MATSim and LCA

- Impact Simulation
- Policy Simulation

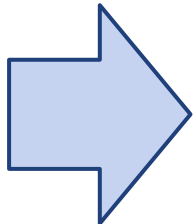
- Extensions
 - Autonomous Vehicles
 - Electric Vehicles
 - Parking Search
 - Active Mobility
 - CO2 & Noise Emissions



www.matsim.org

Coupling MATSim with LCA

- MATSim is a powerful framework to study traffic systems and future mobility scenarios
→ **BUT**: What are the **environmental implications** of new traffic policies?
- Linking MATSim with the LCA-framework could support policy makers in deriving **effective strategies to reduce environmental impacts** from mobility



Goal of this presentation part:

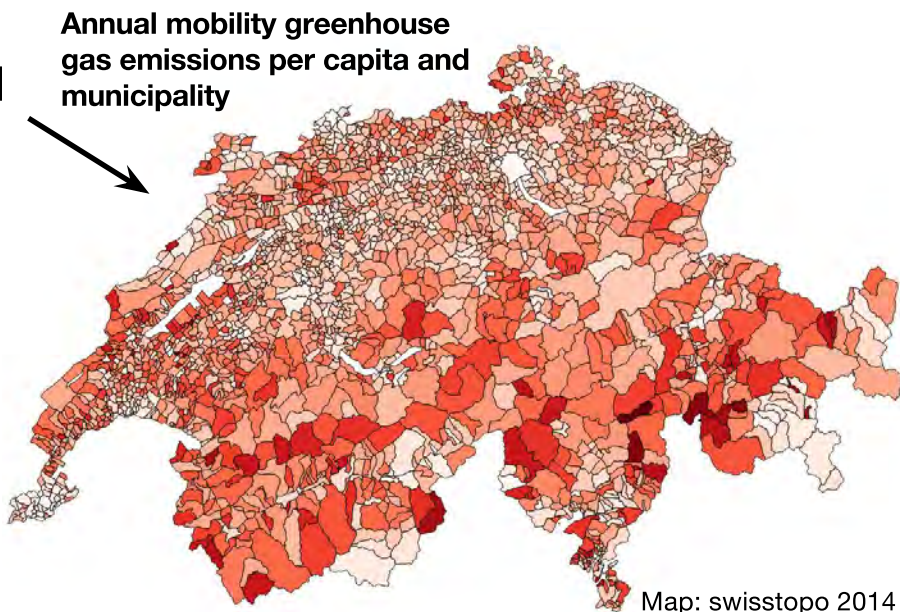
Outlook on the coupling of MATSim with LCA

Coupling MATSim with LCA

Previous work

- Saner et al. 2013: case study Wattwil (CH)
- Froemelt In Hirschberg (ed.) 2016 (THELMA-report): case study Zernez (CH)
- Froemelt in the scope of SCCER
Mobility: current situation in Switzerland
- Cucurachi et al. (to be submitted):
Noise footprints

→ **No LCA-MATSim-study on autonomous vehicles**



Coupling MATSim with LCA

MAS Mobility (ETH): student exercise

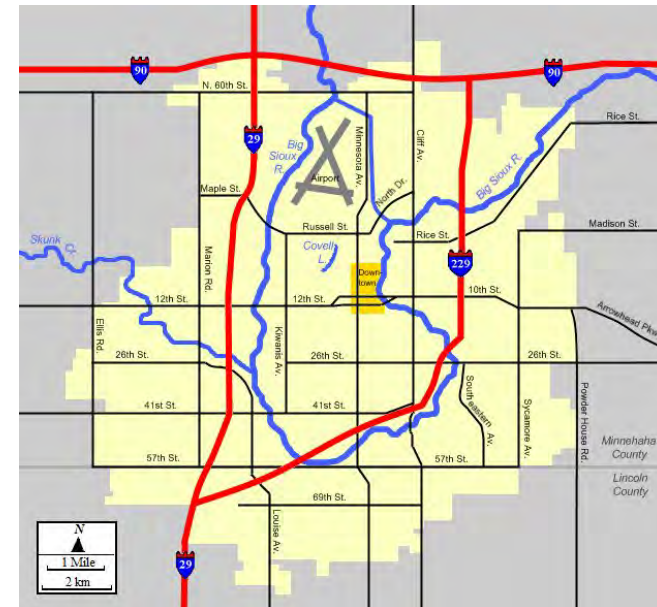
Goal of the exercise:

Development and assessment of different scenarios for the introduction of autonomous vehicles (AV) in Sioux Falls (US)

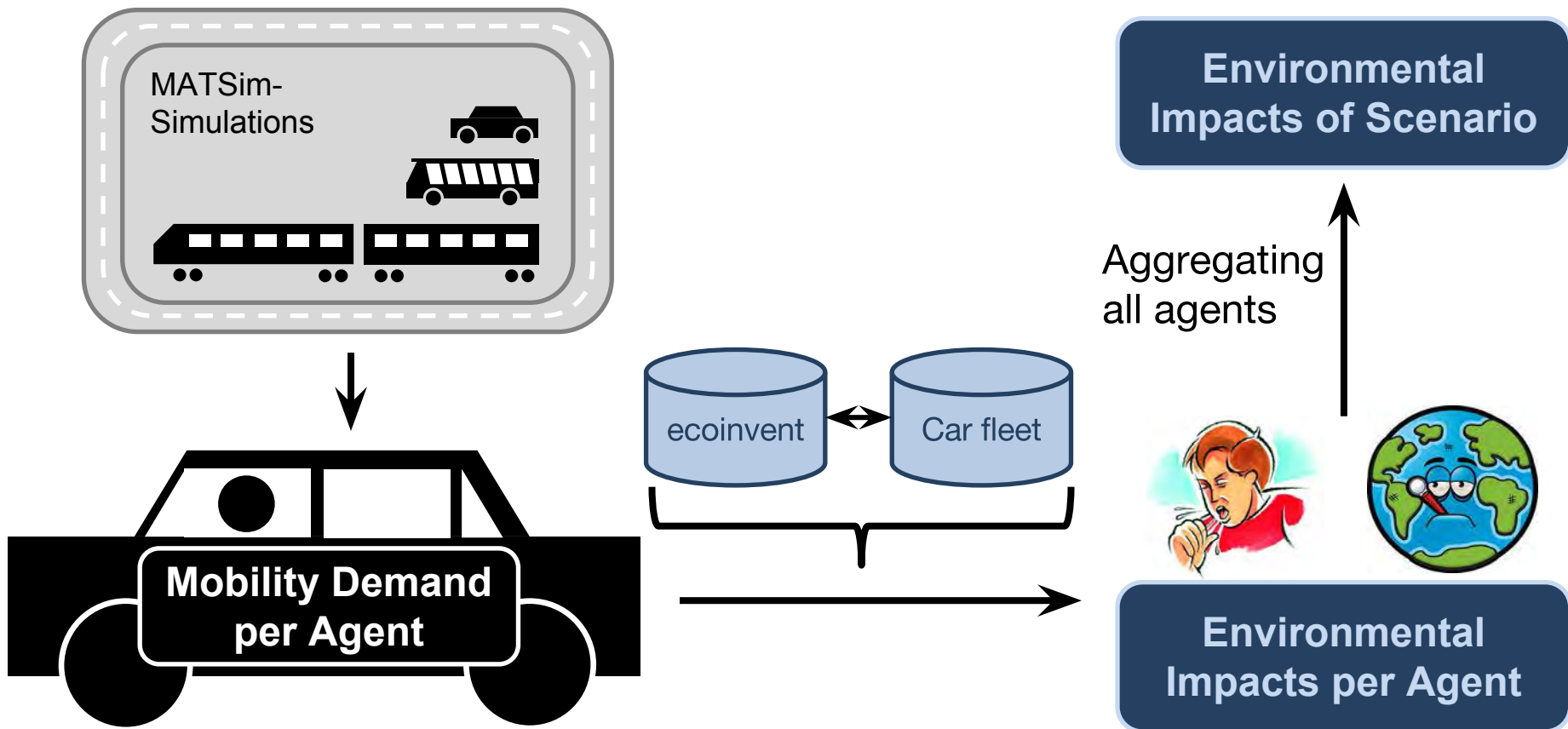
Model parameters which can be adjusted:

- No. of AV-operators
- No. of vehicles per AV-operator
- Mode of operation per AV-operator (taxis vs. pooling/shared taxis)
- Price per kilometer
- Car fleet composition of each AV-operator

Sioux Falls (Wikipedia, 2017)



Coupling MATSim with LCA



Coupling MATSim with LCA

MAS Mobility (ETH): student exercise

Some preliminary conclusions

- **Fleet composition** of AV-operators is essential for environmental performance
- In the case of electric AVs: **electricity mix** is key!
- **Substitution of car trips** by AVs depends strongly on **price** (and AV-availability)

Coupling MATSim with LCA

Outlook

- Improving and fine-tuning the coupling of MATSim with the LCA-framework
- Thorough investigation and evaluation of AV-scenarios

→ This will (hopefully) deliver important insights to **support policy makers in finding effective strategies to lower environmental impacts induced by mobility**

Thank you for your attention - Questions?



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References

- Hörl, S. (2016) Implementation of an autonomous taxi service in a multi-modal traffic simulation using MATSim, Chalmers University of Technology, Gothenburg.
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- Saner, D., N. Heeren, B. Jäggi, R.A. Waraich and S. Hellweg (2013) Housing and Mobility Demands of Individual Households and their Life Cycle Assessment. Environmental Science & Technology **47**(11): 5988-5977.
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