

AN AGENT BASED TRAFFIC MODEL OF VORARLBERG, AUSTRIA

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PROJECT: SMART CITY RHEINTAL



smart city
rheintal

- **Runtime:** 2012 – 2015
- Traffic model creation was only a part
- Funding: Austrian research funding agency FFG
- Total project **costs:** ~3.7 M€ (1.7 M€ funded)
- **Involvement of:**
 - Property developers
 - Local municipalities
 - Research institutions
 - Industry partners...
- **GOALS & conditions:**
 - achieve zero-emission targets
 - 4 regionally typical settlement development projects
 - SmartGrid and Mobility on Demand (MoD)
 - basis: energy autonomy until 2050

illwerke vkw

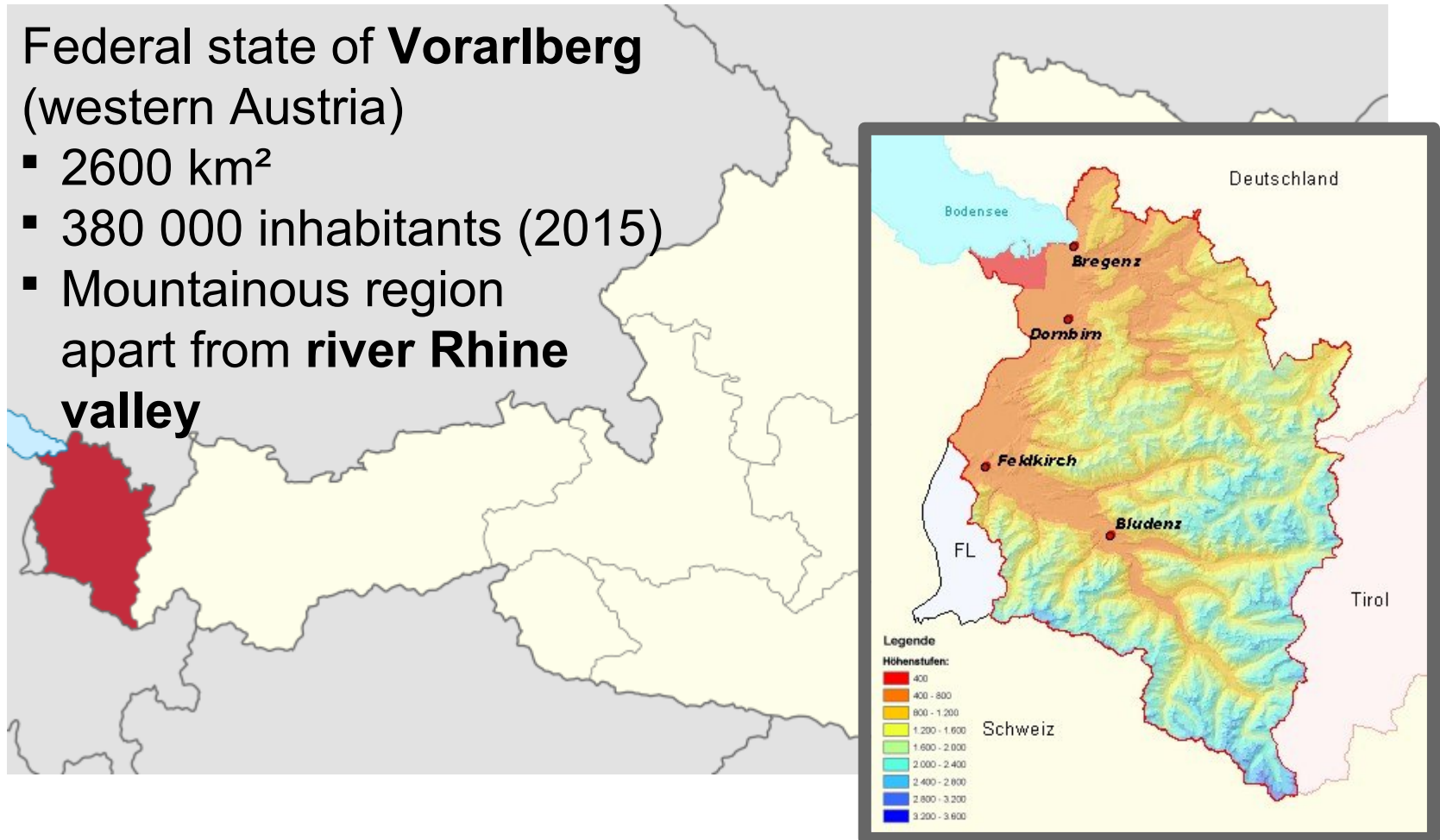


PRISMA 



AREA OF INVESTIGATION

- Federal state of **Vorarlberg** (western Austria)
 - 2600 km²
 - 380 000 inhabitants (2015)
 - Mountainous region apart from **river Rhine valley**



SCENARIO MODEL COMPONENTS

- **Modes considered**

- **MiT** - motorized individual transport

- **PT** - public transport

- **BC** – Bicycles

- **walk** - pedestrians



- **Activities considered**

- Work

- Shop

- Leisure

- Education



- **Software tools**

- **MATSim**

- Mode choice model **MCM**

- in-house development (context-aware mode-sequence)

- AIT multimodal router „**ariadne**“

- Maintains parallel net representation

- (MiT, BC, walk)

- online journey planner "EFA" (PT)

DATA SOURCES

Traffic demand

1. **soc.dem.** (Statistics Austria)

- population, employment
- by age categories
 - Municipal
 - Rastered

2. **Mobility survey 2013**

- 6500 persons
- 3000 households
- 18600 person*trips

3. **Location data**

Fed. Geodata [VoGIS]

- Land use
- Pol database

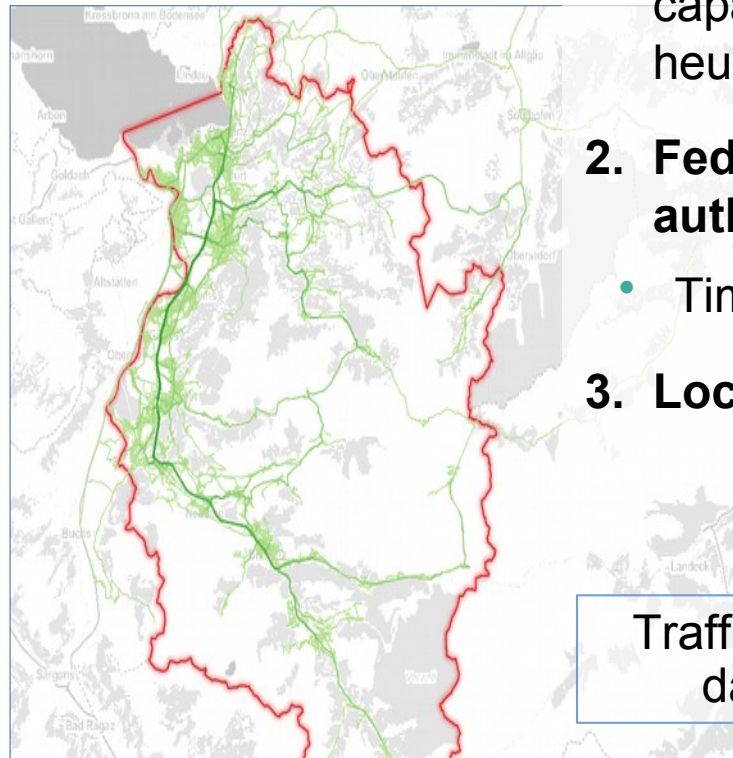
Traffic supply

1. From **OSM export**;
made routable,
capacity, speed, mode
heuristics

2. **Fed. transportation authorities [VVV]**

- Timetable queries

3. **Location data**



Traffic load
daily

TRAFFIC DEMAND MODELING

Population synthesis:

quite dependent on given data

- (aggregation levels, completeness)
- scaling up from small sample
→ to large population
- Using additional knowledge
- Yields population similar in mobility behavior

Methodical:

- assign trip-locations
 - District-wise
 - Similar to survey (trip distances)
 - act./sojourn durations: drawn stochastically

Facility generation:

determination of likely locations

- and capacities
- Shops, Home, Work,
 - Leisure, Education
 - From: Pols, land use & list of schools
 - Generate: probability density
 - Draw accordingly (soc. Demographics)



CONTEXT SENSITIVE MODE CHOICE MODELING

Mode-sequence & location aware

- (Mode-choices are not independent)
- **Preparatory tasks:**
 - Mobility survey data cleaning
 - Alternative stage chain generation (for each survey decision)
- **Alternative stages' TT** from:
 - EFA (PT)
 - „ariadne“ (other modes)
 - Regression model for distortions in survey data (e.g.: parking spot hunt time, bus delays, ...)
 - Averaging for correction of geographic inaccuracies

csMCM regards:

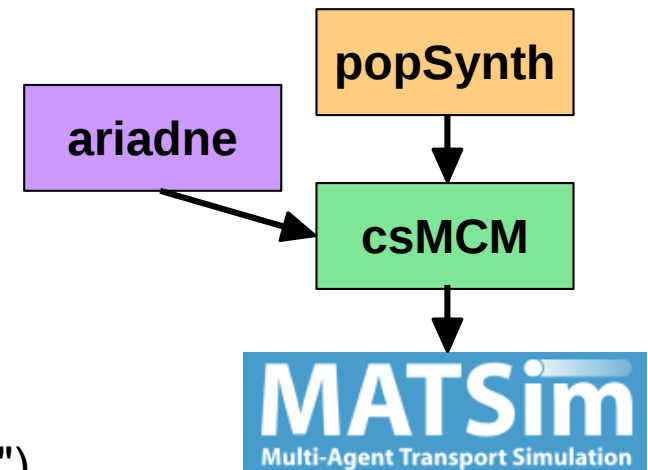
- Trip dep. vars (stage TT, dist., waiting, #changes)
- Trip chain dep. vars (prev. Modes, tot. Dist.)
- **Estimation** is done by maximum Likelihood method

CsMCM application:

- Generate several probable choices for each trip-chain
- Pick one (some)
- Convert to plans

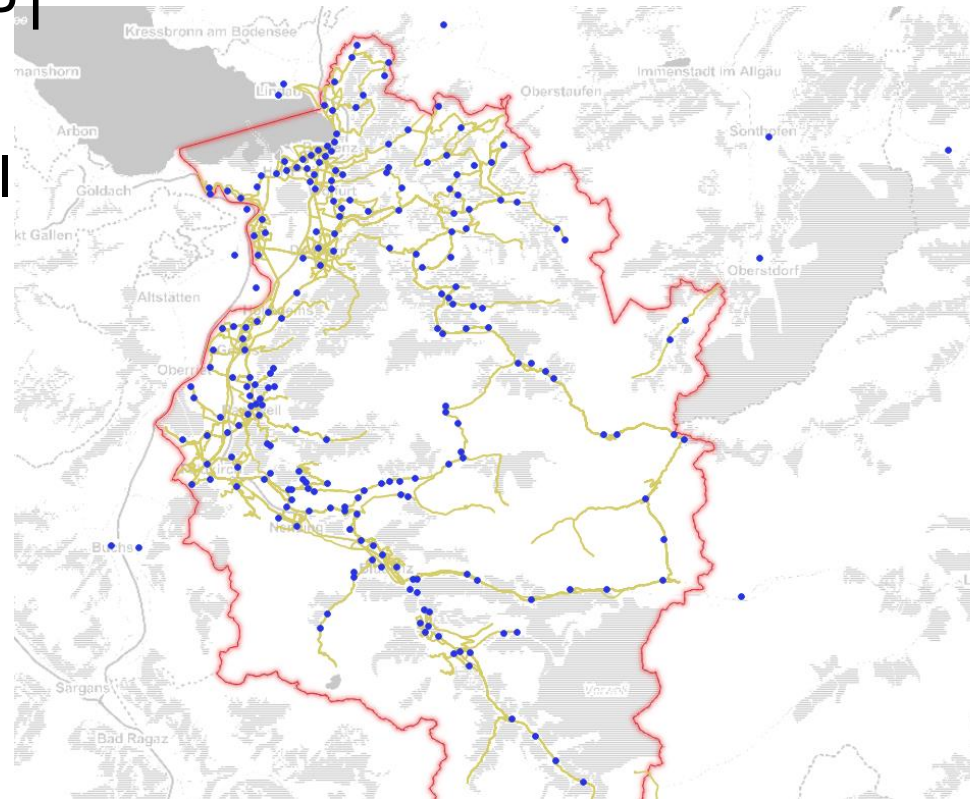
STUDIED SCENARIOS' OVERVIEW

- simulated cooperatively with **MATSim** and **our tools**
 1. PT transport development ("**PT+**")
 - improving the timetable intervals
 2. new traffic demand causations ("**newOD**")
 - 3 large-scale construction projects
 3. introduction of new bikeways ("**room4bikes**")
 - make planned federal bike routes available
 4. demands for EV charging infrastructure ("**optEVplugs**")
 - e-MIV charging spots
 - Energy demand
 - Charging strategies



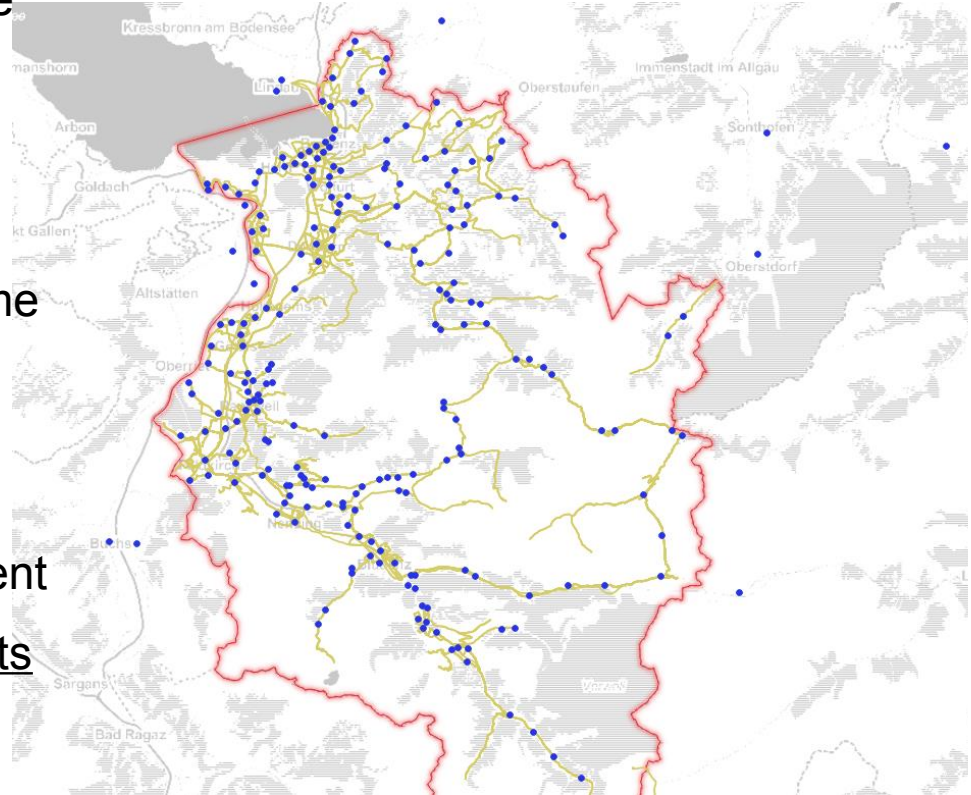
SCENARIO “PT+“

- increasing frequency of PT timetables
- all regular lines of federal traffic region Vorarlberg
 - and connections to neighboring federal states and countries
- no seasonally limited traffic
(Ski- / Hiking buses)

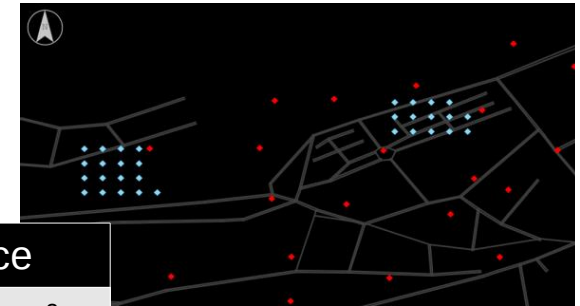


SCENARIO “PT+“

- no single PT-plan relations were available
- "virtual" improvement by
 - for every route (queried)
 - reduction of total waiting time to 50%
 - on whole connection infrastructure
- re-running modal split assignment
 - considering only 2 OD points per municipality
- **increase of PT share** in the modal split by **2.5 %**



SCENARIO “NEWOD”

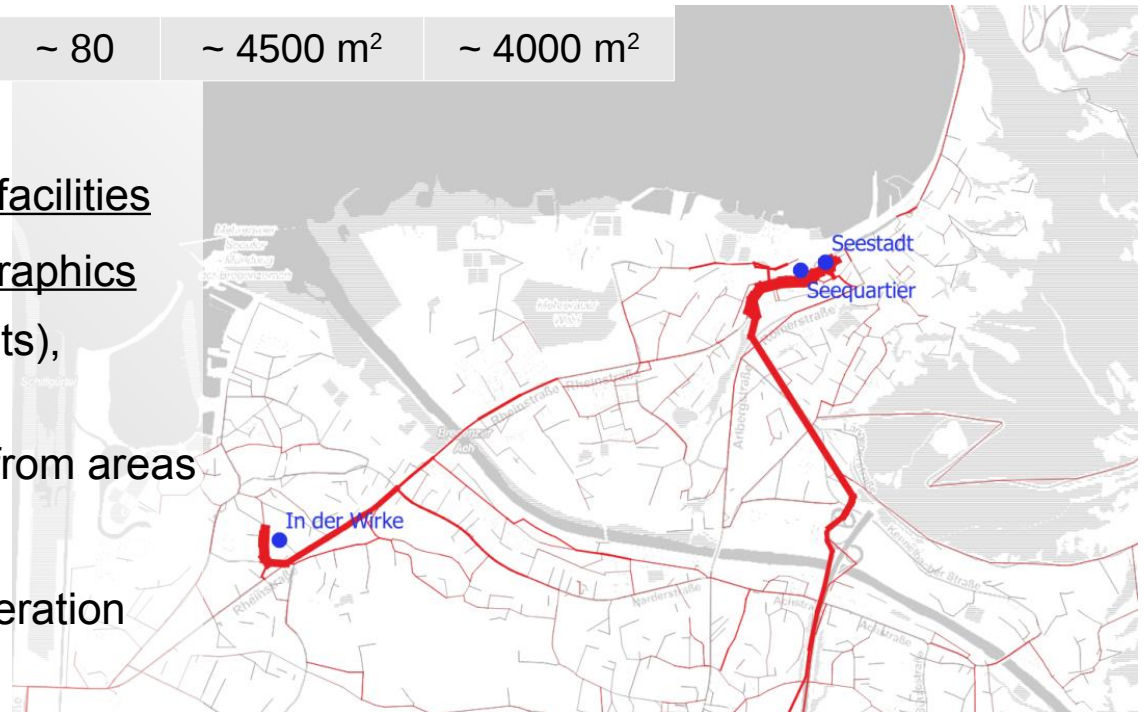


- 3 large-scale construction projects

Location	flats	commerce	office
Seestadt Bregenz	65	12000 m ²	1500 m ²
Seequartier (Bregenz)	120	~ 4500 m ²	1400 m ²
In der Wirke (Hard)	~ 80	~ 4500 m ²	~ 4000 m ²

- **Implementation**

- introducing additional facilities
- changing sociodemographics
 - population (habitats), workplaces
- estimating capacities from areas
 - leisure, shopping
- Demand, csMCM generation
- MATSim optimization



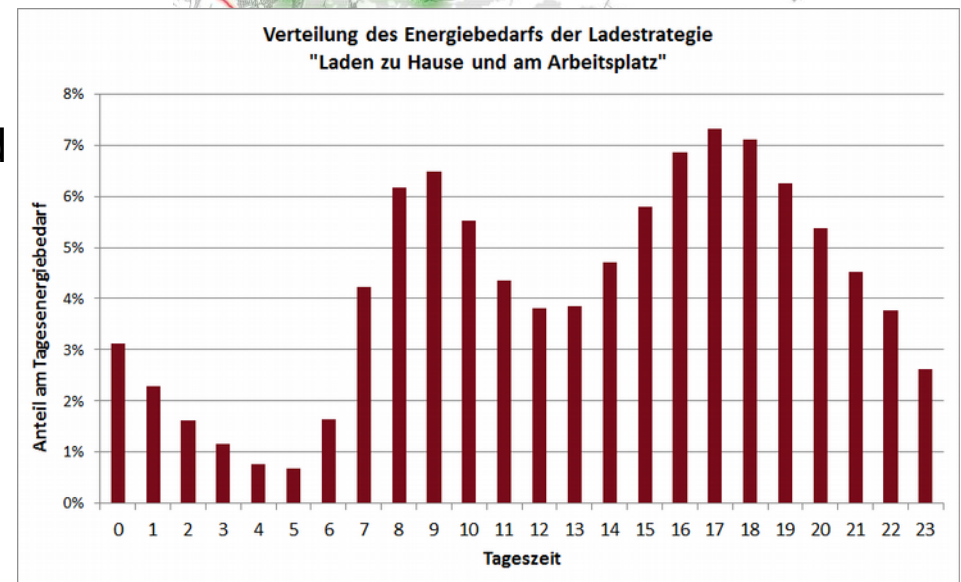
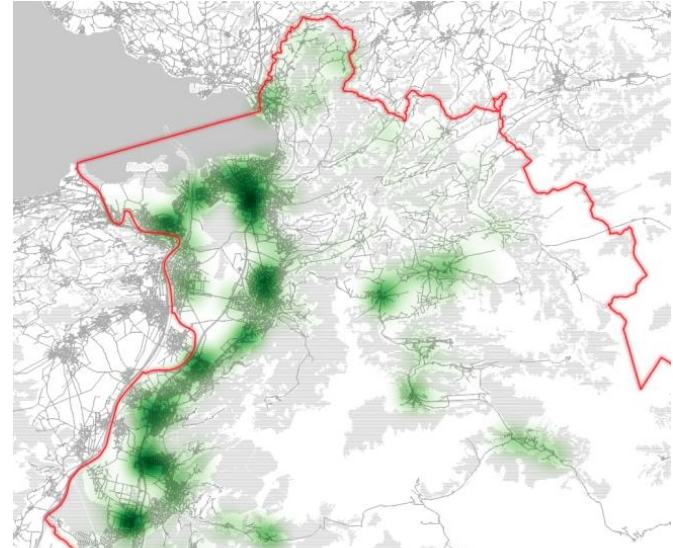
SCENARIO “OPTEVPLUGS“

Assumptions:

- ALL conventional vehicles replaced by electric vehicles
- charging facility availabilities
 - a) Home
 - b) Work
 - c) home & work
- charging whenever possible and sojourn > 1h
- 4 types of electric vehicles

Conclusions:

- required energy throughout the day
- number of charging processes



CONCLUDING REMARKS

- ◆ this was a pilot project in our research group
- ◆ MATSim showed promising, flexible possibilities for modeling mobility
- ◆ allowing impact assessment with higher relevance than conventional macroscopic tools
- ◆ led to intent to further employ
MATSim in ongoing and future projects
 - Micro-PT (collective taxi)
 - construction site impact

REFERENCES

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THANK YOU!

Gerald Richter, 2017-09-11

