



## **GNSS based research instruments for understanding future cities mobility needs**

**Innovative space-based solutions for Future Cities**

Stephan Leppler

Innovation Centre for Mobility and Societal Change



## 1. About InnoZ



## 2. InnoZ-Tracks



## 3. Mobility Database & Dashboard



## 4. Mobility Models

Science

Research



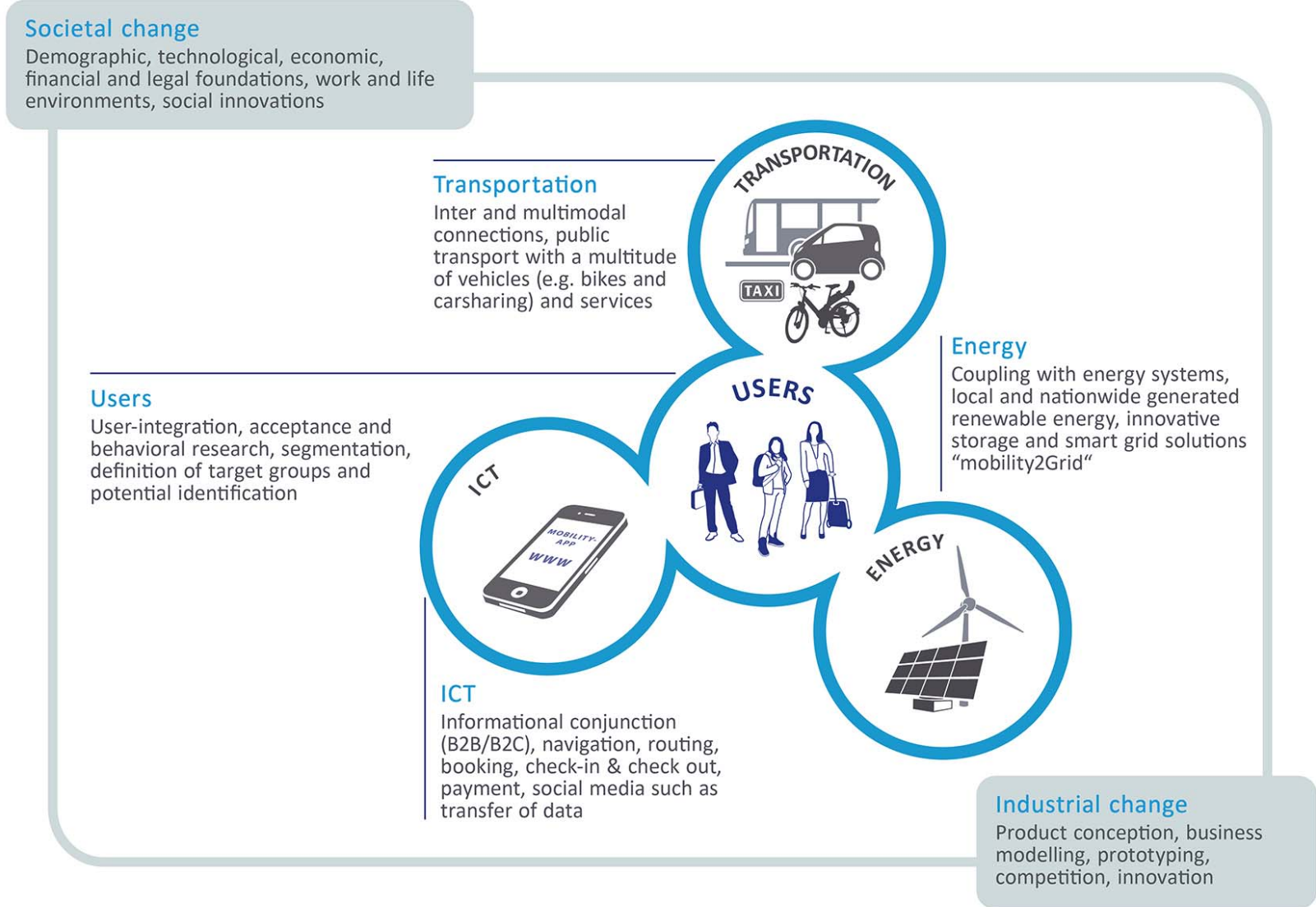
Industry

Practice

## Key Facts

- Founded in 2006
- 5 equitable shareholders
- 12-person scientific advisory board
- Headquarters in Berlin, since 2013 representative offices in Munich and London
- 80 employees with roughly 30 projects

# Our Goal: Three-way integration





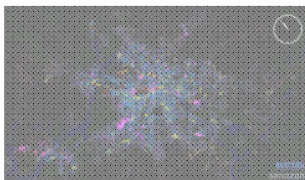
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# InnoZ-Tracks

Smartphone based automated travel surveys

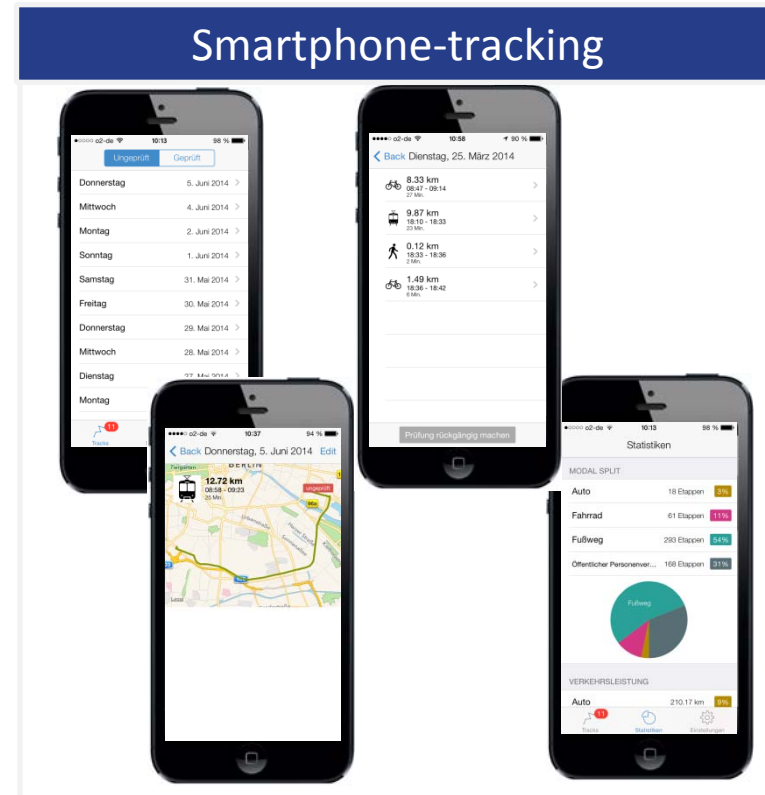


## Diary-based travel surveys

PERSON Form 1 TRAVEL DAY M			PERSON Form 1 TRAVEL DAY MONDAY			
<b>FOURTH TRIP</b>	<b>FIFTH TRIP</b>	<b>SIXTH TRIP</b>	<b>FOURTH TRIP</b>	<b>FIFTH TRIP</b>	<b>SIXTH TRIP</b>	<b>SEVENTH TRIP</b>
STARTING TIME am <input type="checkbox"/> pm <input type="checkbox"/>	STARTING TIME am <input type="checkbox"/> pm <input type="checkbox"/>	STARTING TIME am <input type="checkbox"/> pm <input type="checkbox"/>	STARTING TIME am <input type="checkbox"/> pm <input type="checkbox"/>	STARTING TIME am <input type="checkbox"/> pm <input type="checkbox"/>	STARTING TIME am <input type="checkbox"/> pm <input type="checkbox"/>	STARTING TIME am <input type="checkbox"/> pm <input type="checkbox"/>
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DISTANCE km mi	DISTANCE km mi	DISTANCE km mi	DISTANCE km mi	DISTANCE km mi	DISTANCE km mi	DISTANCE km mi

Please use the un-numbered form for the rest of your trips

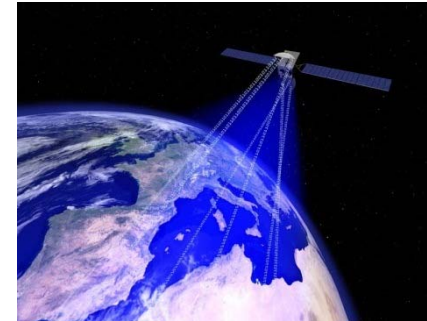
- Trips underreported
- Travel times often over/under-estimated
- Inconvenient for users



- Passive data gathering
- No more complicated surveys
- Allows for long-term analysis
- High level of detail

## Benefits of GPS-Tracking

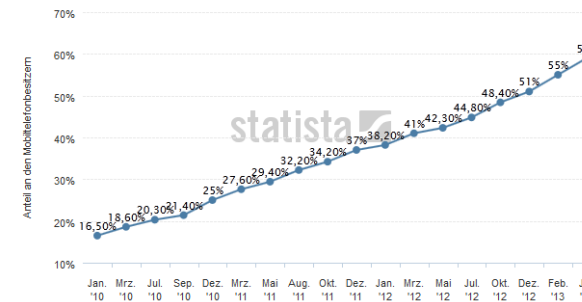
- Accurate
- Easy to use
- Scalable
- Cost-efficient



## Benefits of Smartphone-Tracking

- Existing smartphone market
- No additional hardware required
- Integrates easily into existing habits
- Familiar operating system

Anteil der Smartphone-Nutzer an allen Mobiltelefonbesitzern in Deutschland von Januar 2010 bis Juli 2013

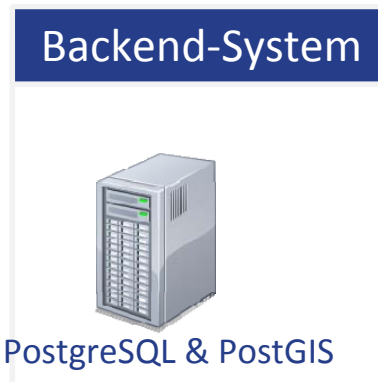
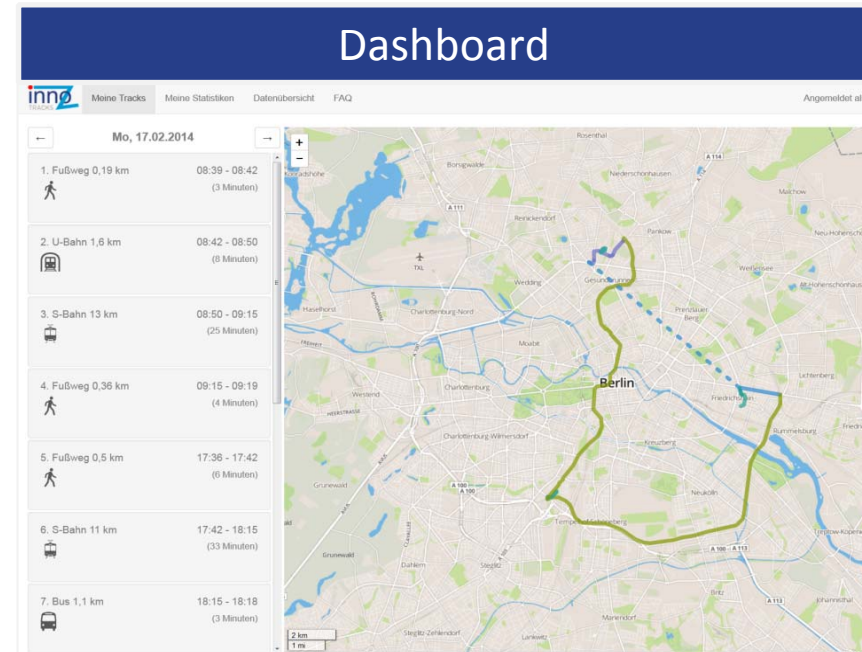
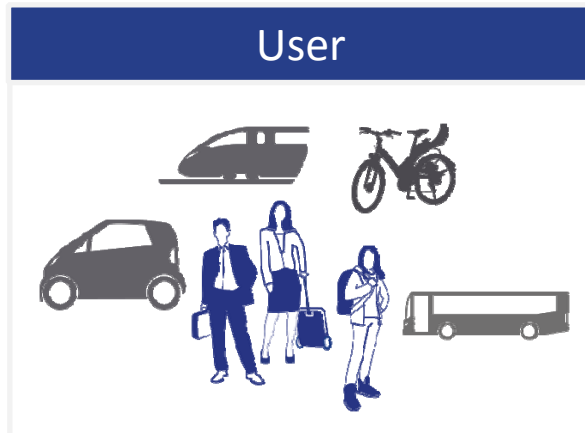


## Challenges

- Data security
- Recruiting participants
- Platform-related challenges

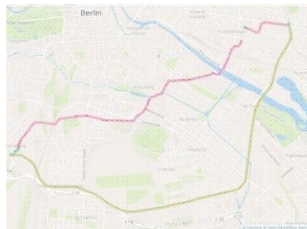








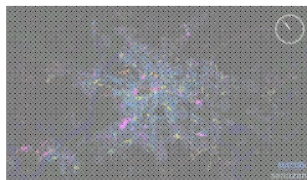
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## 3. Mobility Database & Dashboard

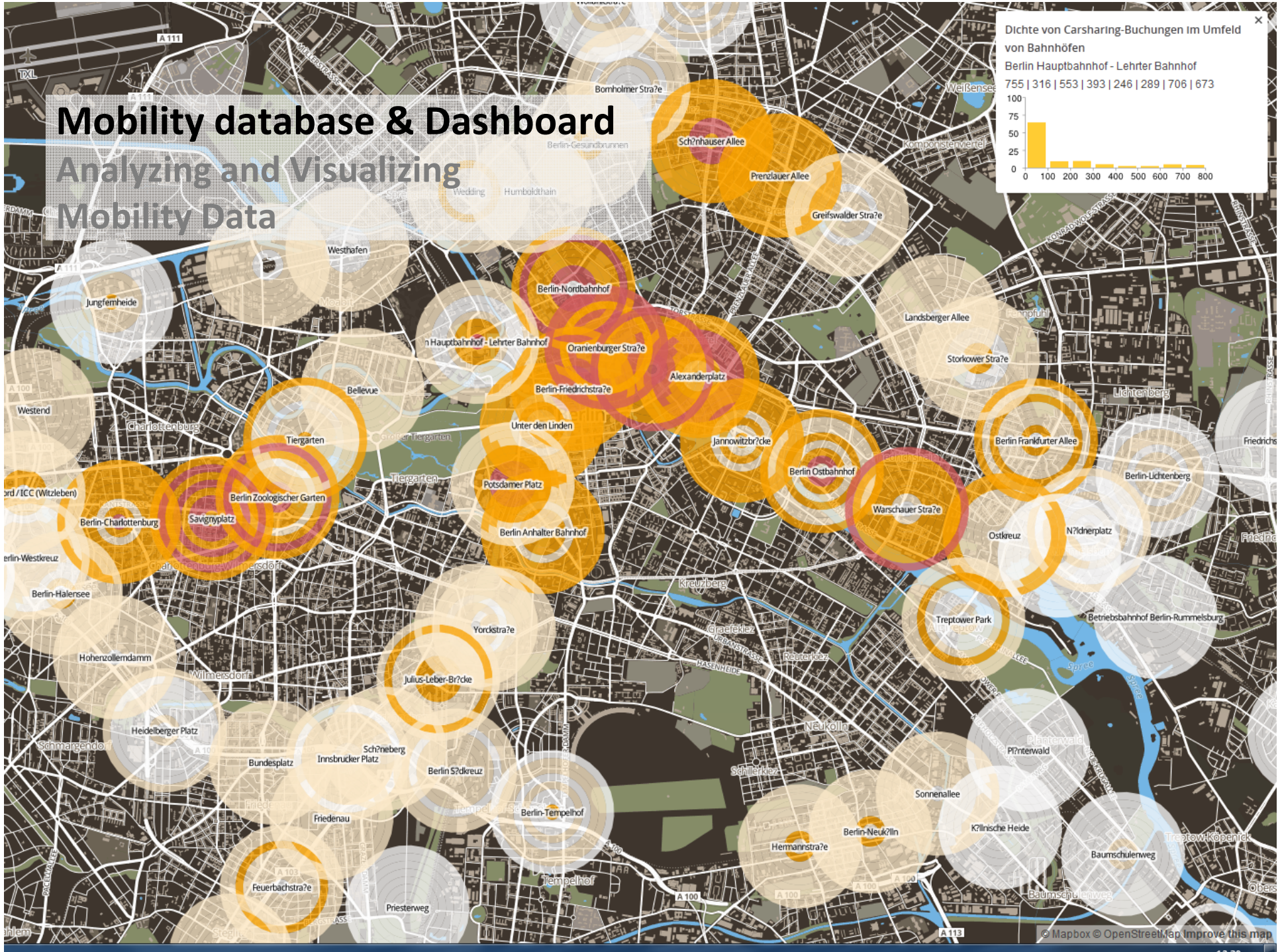
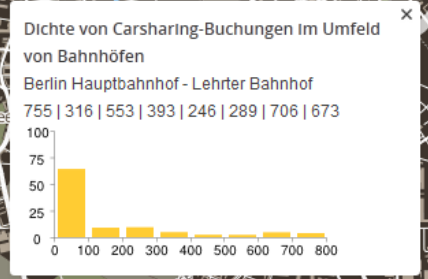


## 4. Mobility Models



# Mobility database & Dashboard

## Analyzing and Visualizing Mobility Data





# Mobility database & Dashboard

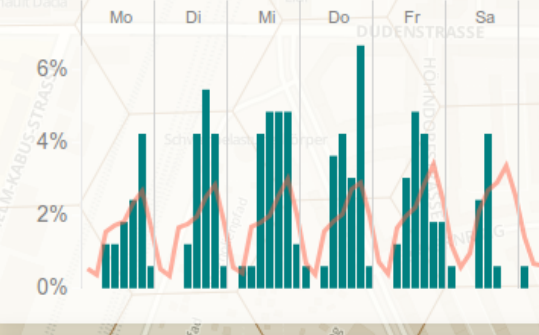
## Analyzing and Visualizing Mobility Data



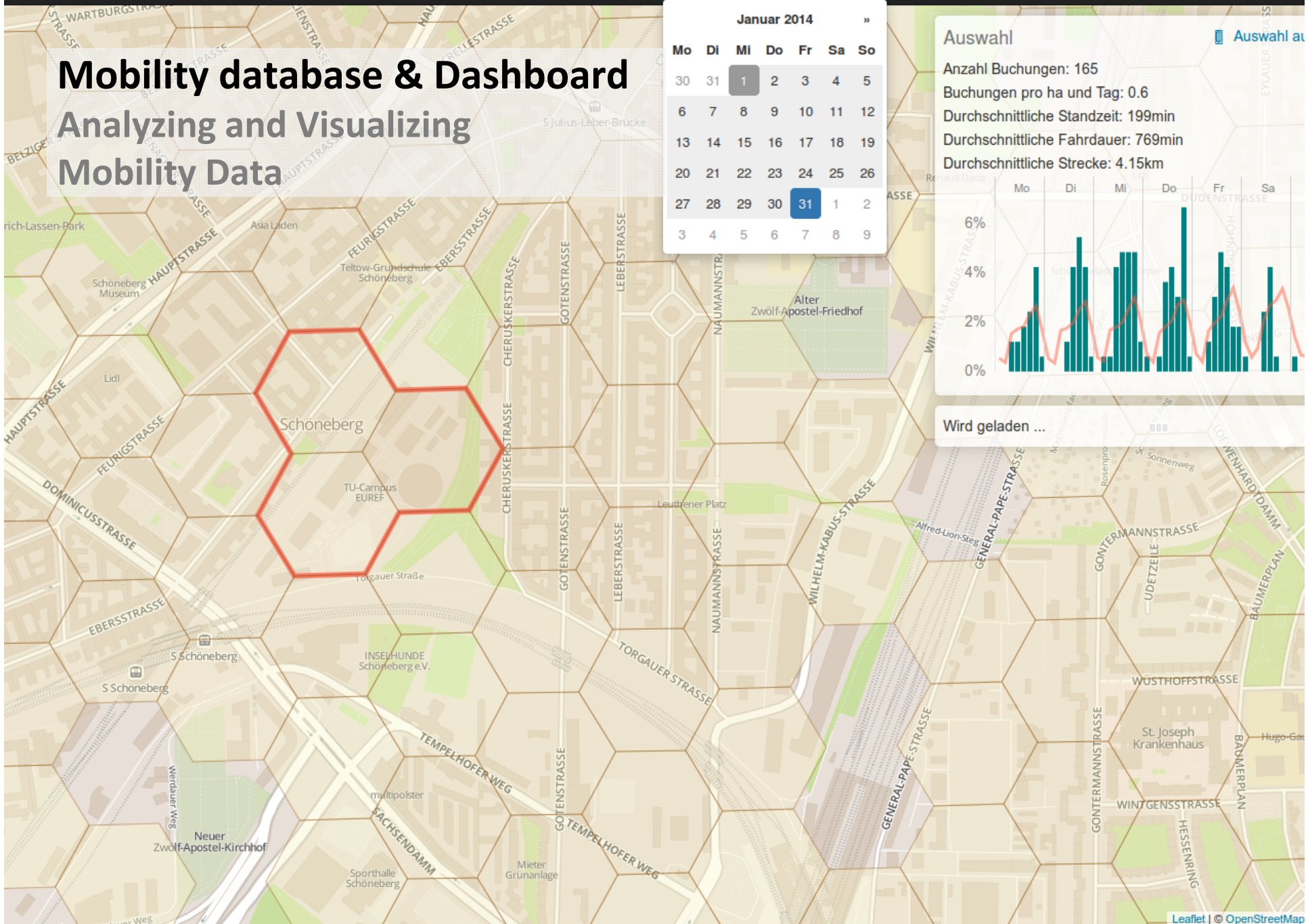
### Auswahl

Auswahl an

Anzahl Buchungen: 165  
 Buchungen pro ha und Tag: 0.6  
 Durchschnittliche Standzeit: 199min  
 Durchschnittliche Fahrdauer: 769min  
 Durchschnittliche Strecke: 4.15km

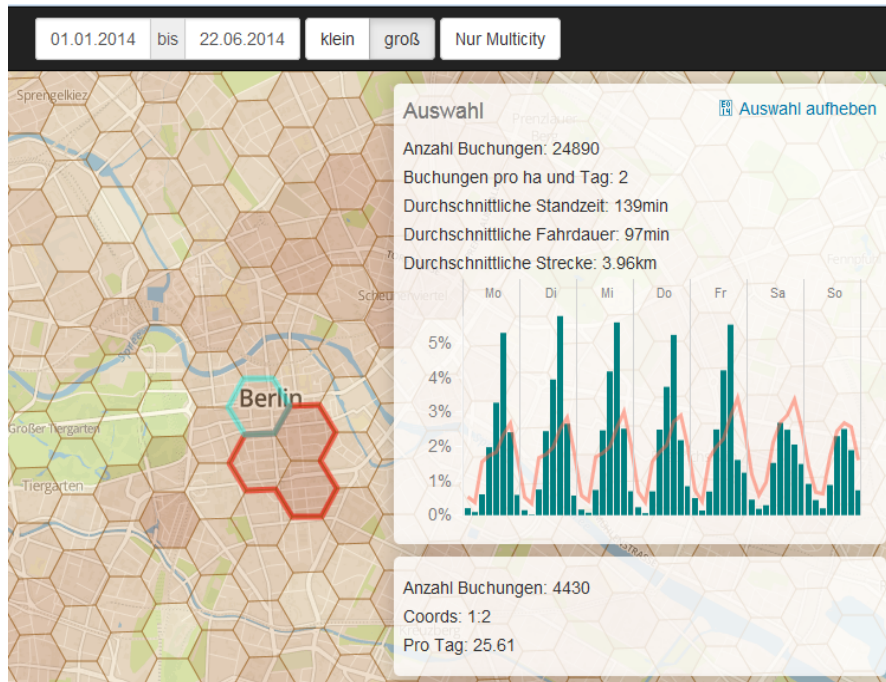


Wird geladen ...

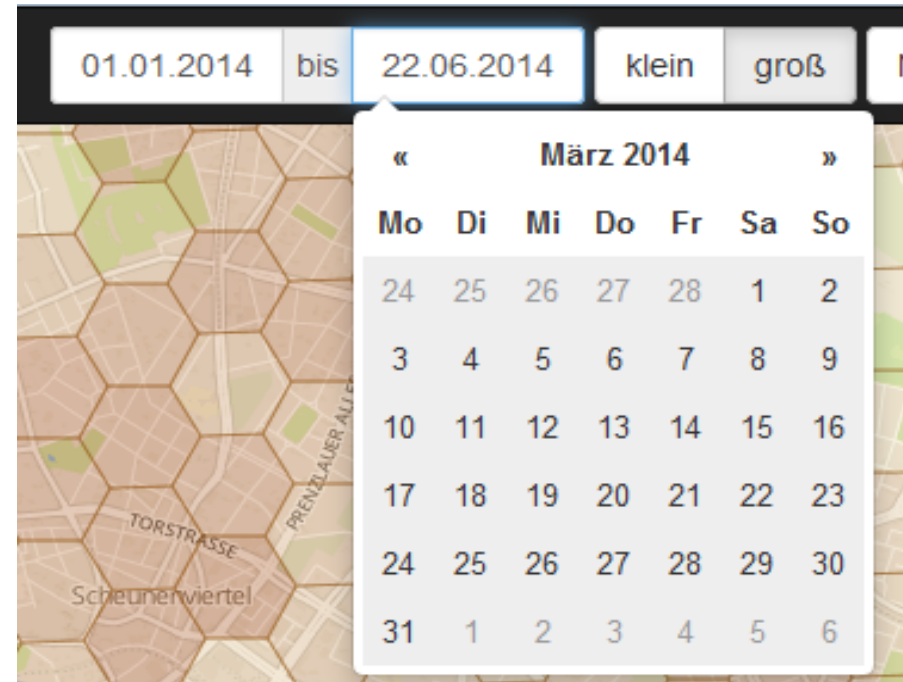




Show data for one or more selected spatial units over a chosen time period

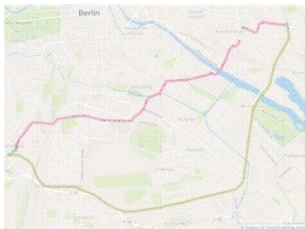


Temporal pattern development

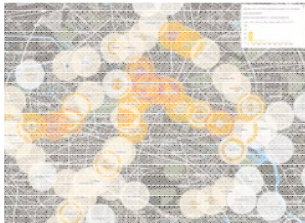




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## Mobility Models

Simulating mobility behaviour  
and attitudes towards mobility services

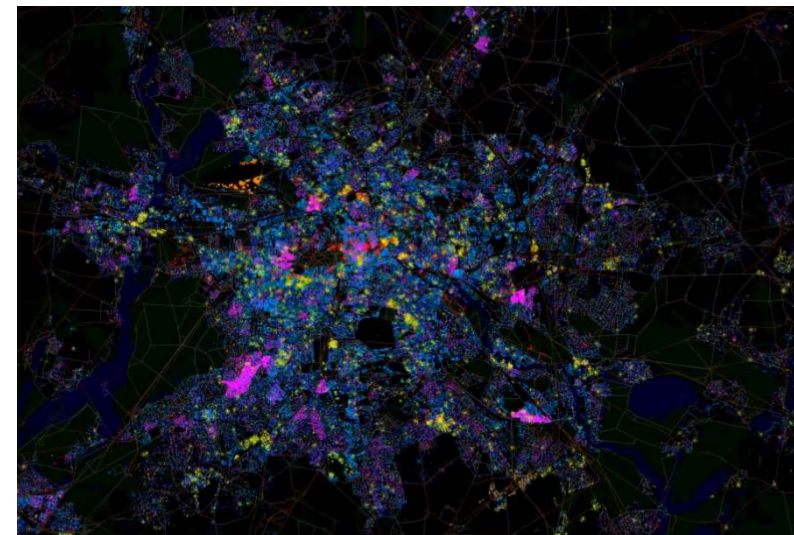
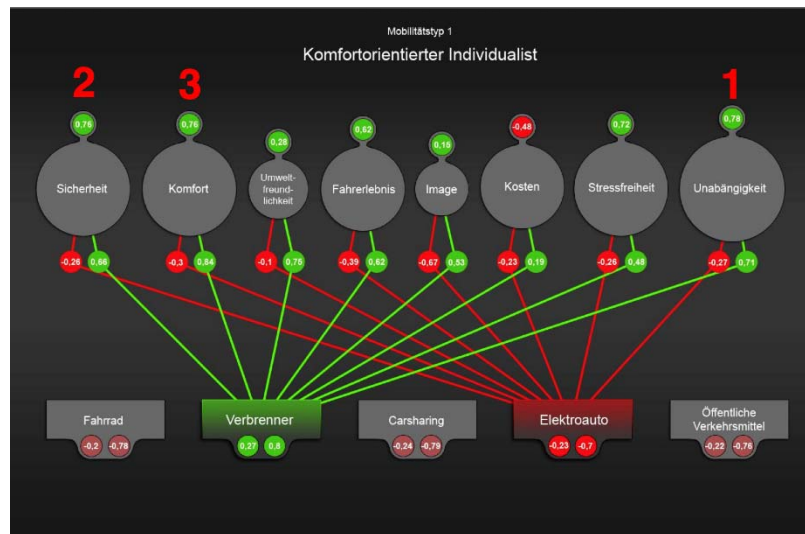


## InnoMIND

- Iterative Multi-agent simulation
- Simulates communication processes and examines their impact on attitudes towards mobility services
- Outcome: Mapping of mobility services preferences

## MATSim

- Iterative Multi-agent simulation
- Simulation of daily mobility behaviour and schedules
- Assesses traffic effects of scenarios (infrastructure, pricing, population scenarios etc.)
- Outcome: Usage of mobility services and transport

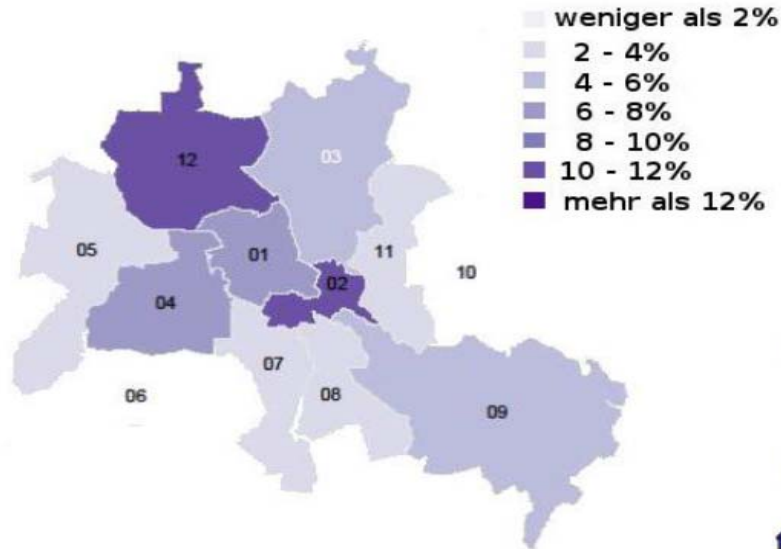




## InnoMIND

## MATSim

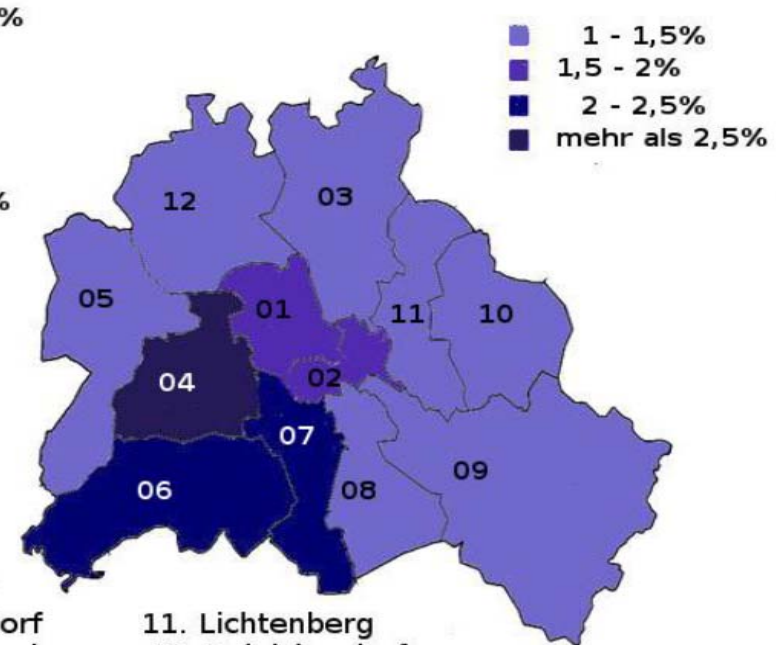
### Carsharing preferences



- 01. Mitte
- 02. Friedrichshain - Kreuzberg
- 03. Pankow
- 04. Charlottenburg - Wilmersdorf
- 05. Spandau

- 06. Steglitz - Zehlendorf
- 07. Tempelhof - Schöneberg
- 08. Neukölln
- 09. Treptow - Köpenick
- 10. Marzahn - Hellersdorf

### Carsharing usage



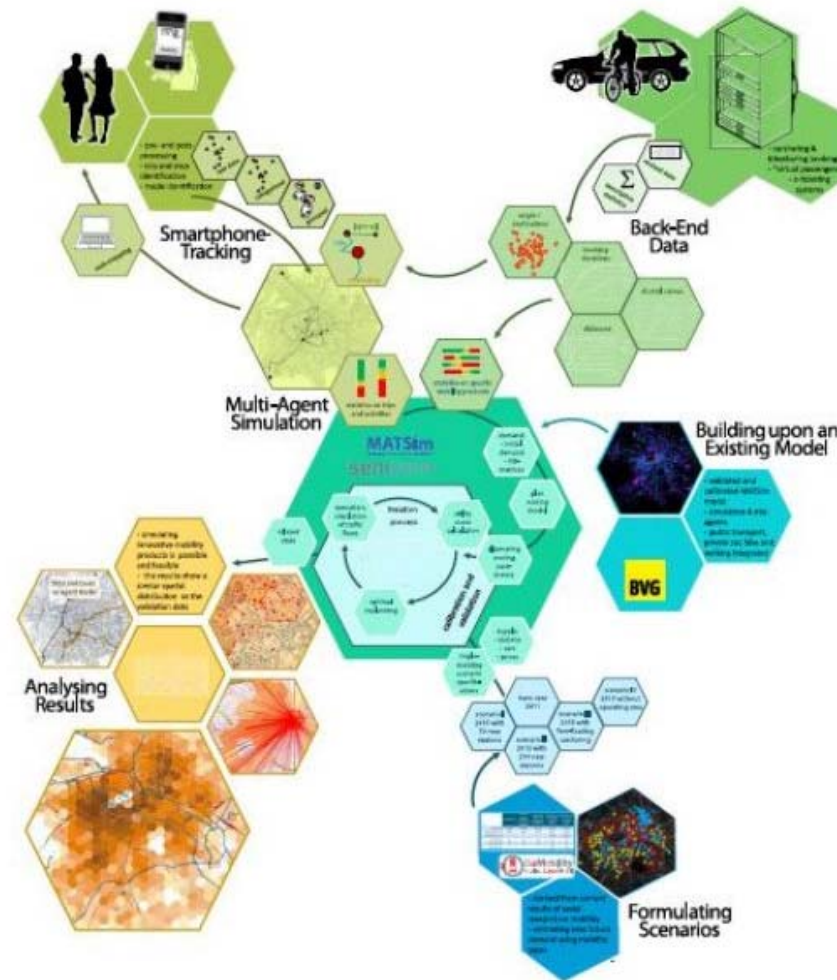
- 11. Lichtenberg
- 12. Reinickendorf

Source: Akkaya 2014

Preferences of all Agents towards CS

Modal Share for Agents with CS Membership

# Putting the pieces together





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Prof. Dr. Andreas Knie

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- German centre for Aerospace e.V.