



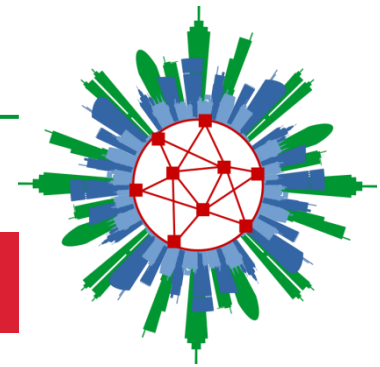
DLR

**Deutsches Zentrum  
für Luft- und Raumfahrt e.V.**  
in der Helmholtz-Gemeinschaft

**Institut für Verkehrssystemtechnik**

SuMoCoS

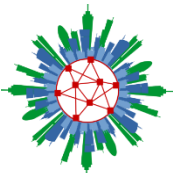
Sustainability and Mobility  
in the Context of Smart Cities



# Digital Urban Mobility

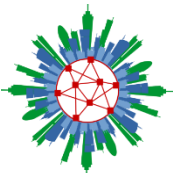
**Christian Rahmig**

**[christian.rahmig@dlr.de](mailto:christian.rahmig@dlr.de)**



# Urban Mobility is changing

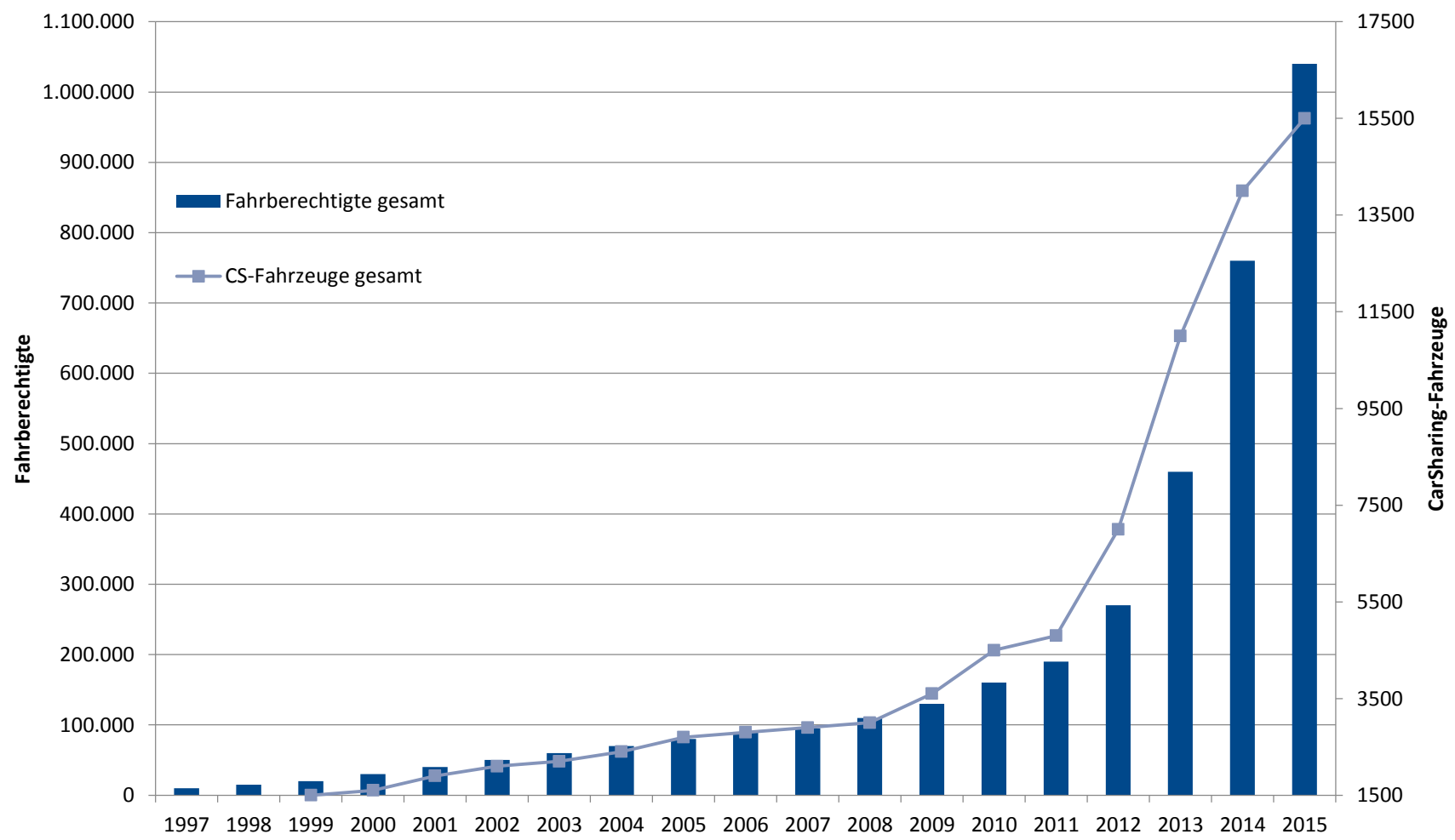




# Urban Mobility is changing

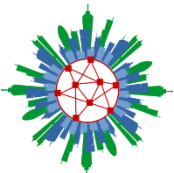


## ■ New services extend the range of options



Carsharing Development in Germany

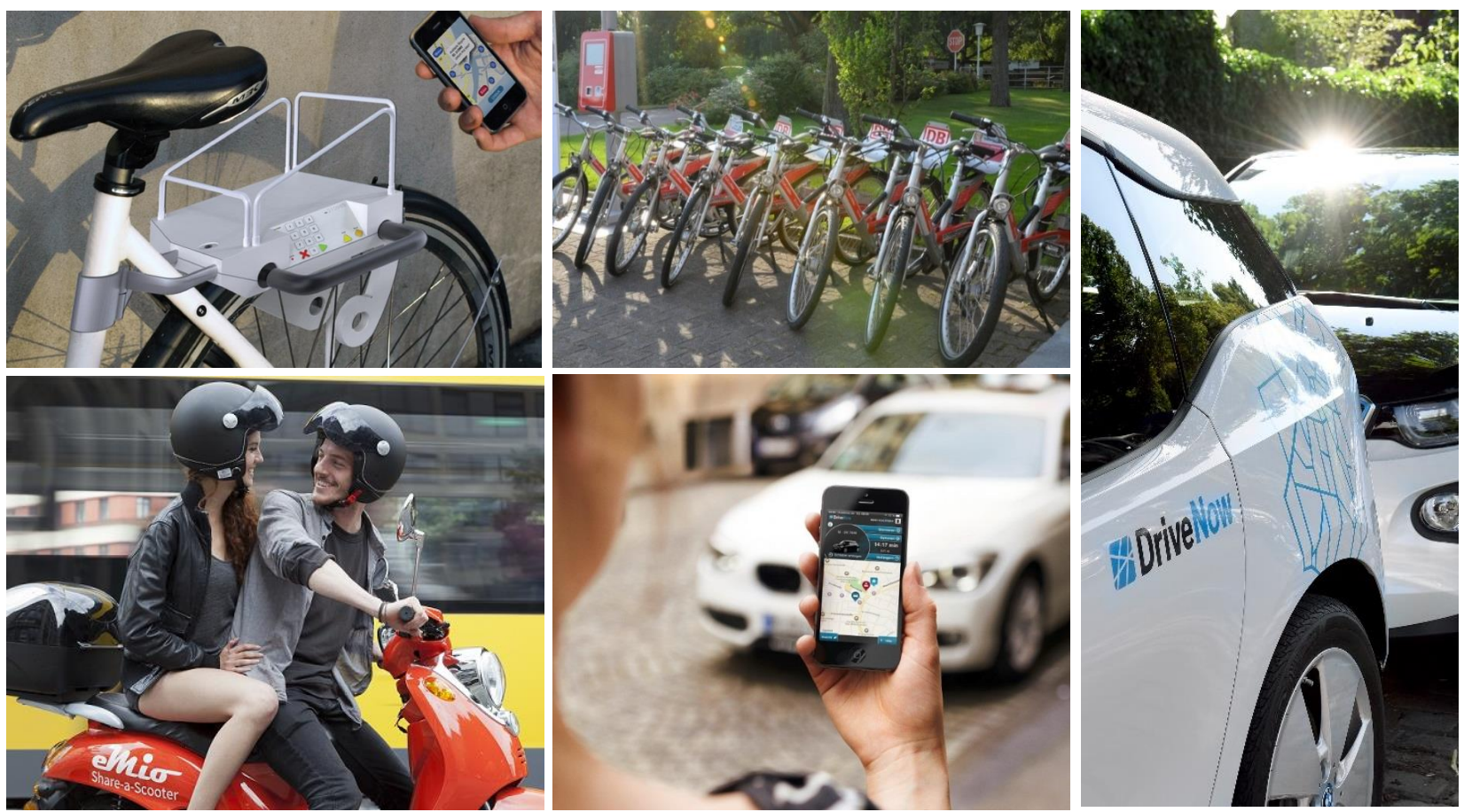
Data source: Bundesverband CarSharing 2015

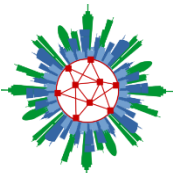


# Urban Mobility is changing



- New mobility services complement existing modes of transport

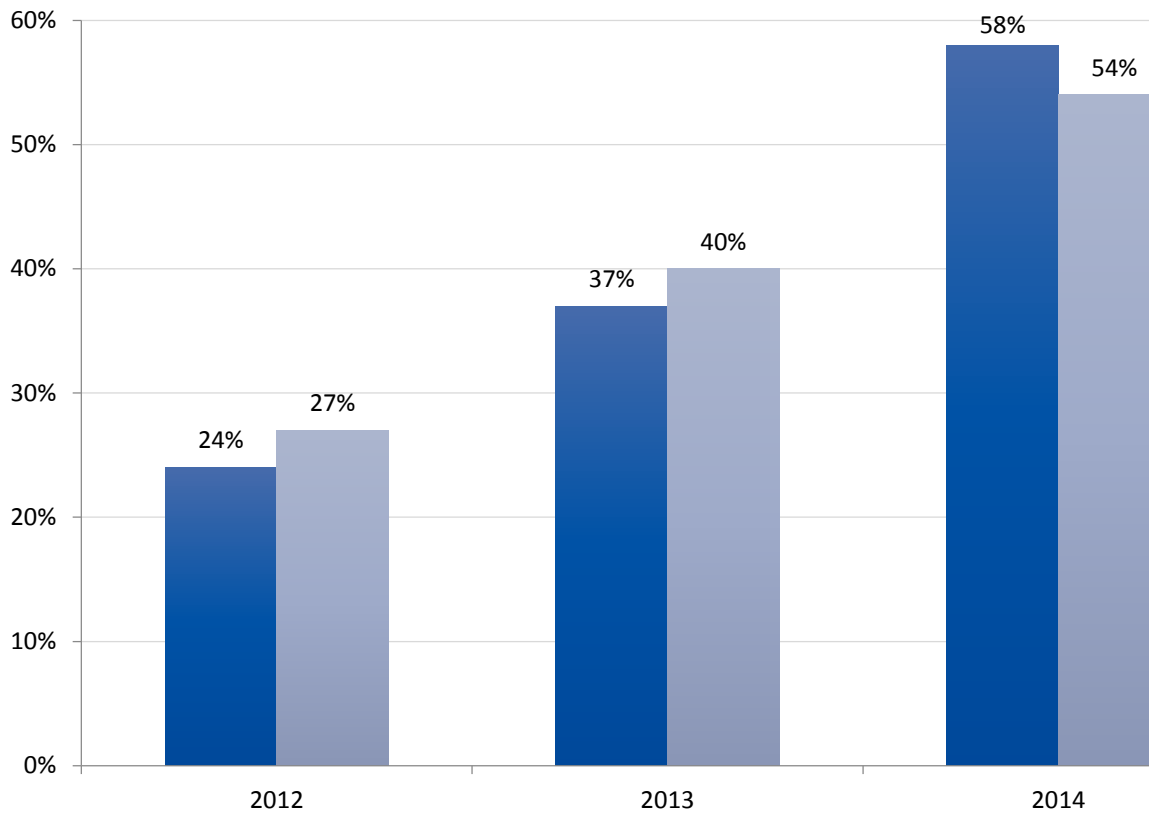




# Urban Mobility is changing



## ■ Increased usage of Information & Communication Technologies



**People are online:**

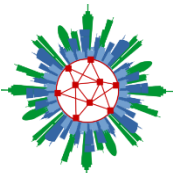
2012:  
133 min/day  
**thereof 23 % along the way**

2014:  
166 min/day  
**thereof 50 % along the way**

**Smartphone ownership and mobile Internet usage in Germany**  
(share of population in per cent)

Sources: DLR; Data source: ARD/ZDF-Onlinestudien 2012, 2013 & 2014; BITKOM 2014, Initiative D21



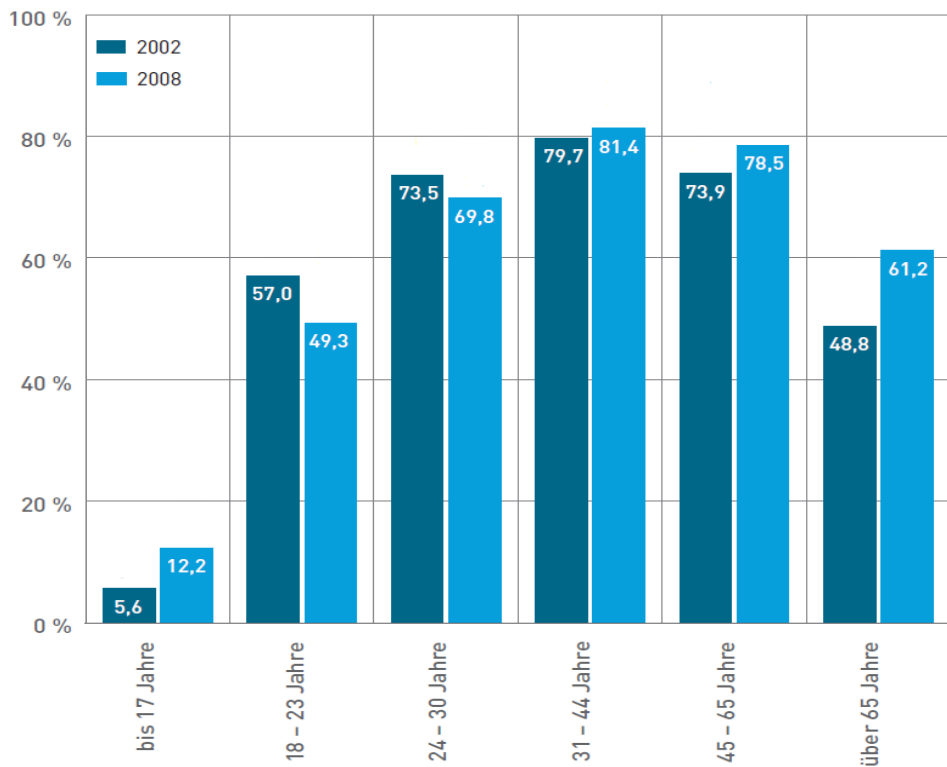


# Urban Mobility is changing



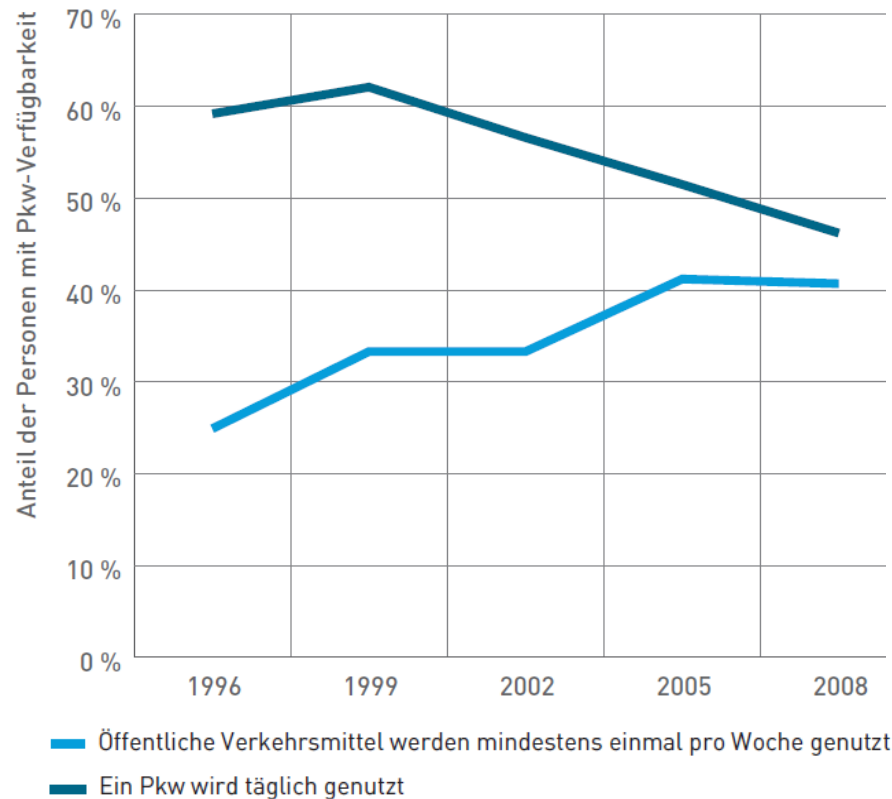
- The own car loses importance for young people

### Car availability by age

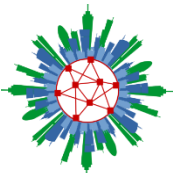


Data sources: MiD 2002 (DIW und infas 2002),  
MiD 2008 (BMVBS et al. 2008)

### Decreasing daily usage of car, increasing weekly usage of public transport among 20-30 yo

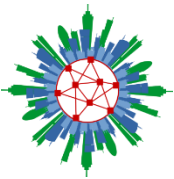


Data source: MOP (Zumkeller et al. 2011)

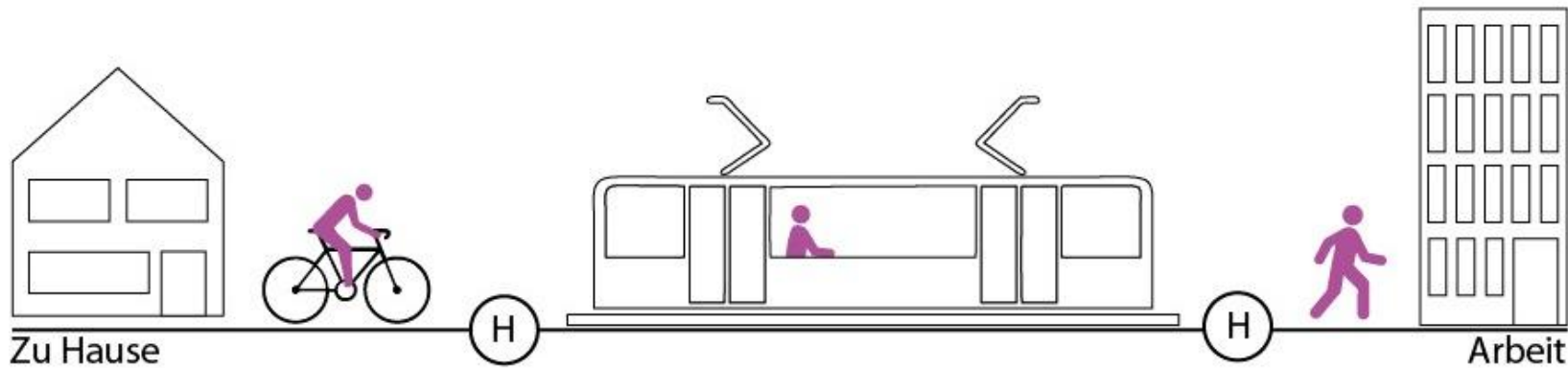


# Urban Mobility is changing



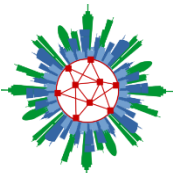


- Key to a **more efficient** and **needs-oriented** transport system?



- Usage of different transport modes along the journey  
(Jones et al 2000, Chlond 2013)
- Need for research, in particular in field of regular urban mobility





- A systemic approach:

## The intermodal user



Intermodal usage patterns



Individual evaluation and decision criteria

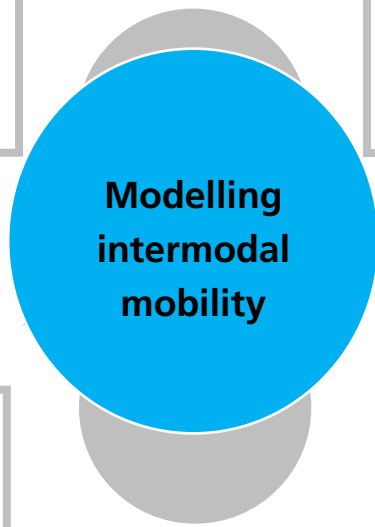
## Urban Area



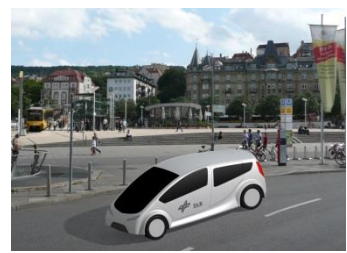
City structures and infrastructures



Distribution and design of intermodal nodes



## New Mobility Concepts



Requirements to car and mobility concepts of the future



New mobility services

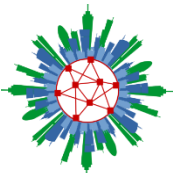
## Connection, Dialogue & Transfer



National and international experiences



Obstacles / risks & potentials



# Intermodality



## ■ Study cities



Berlin



Kopenhagen



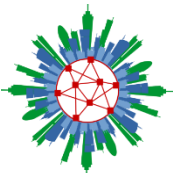
Paris



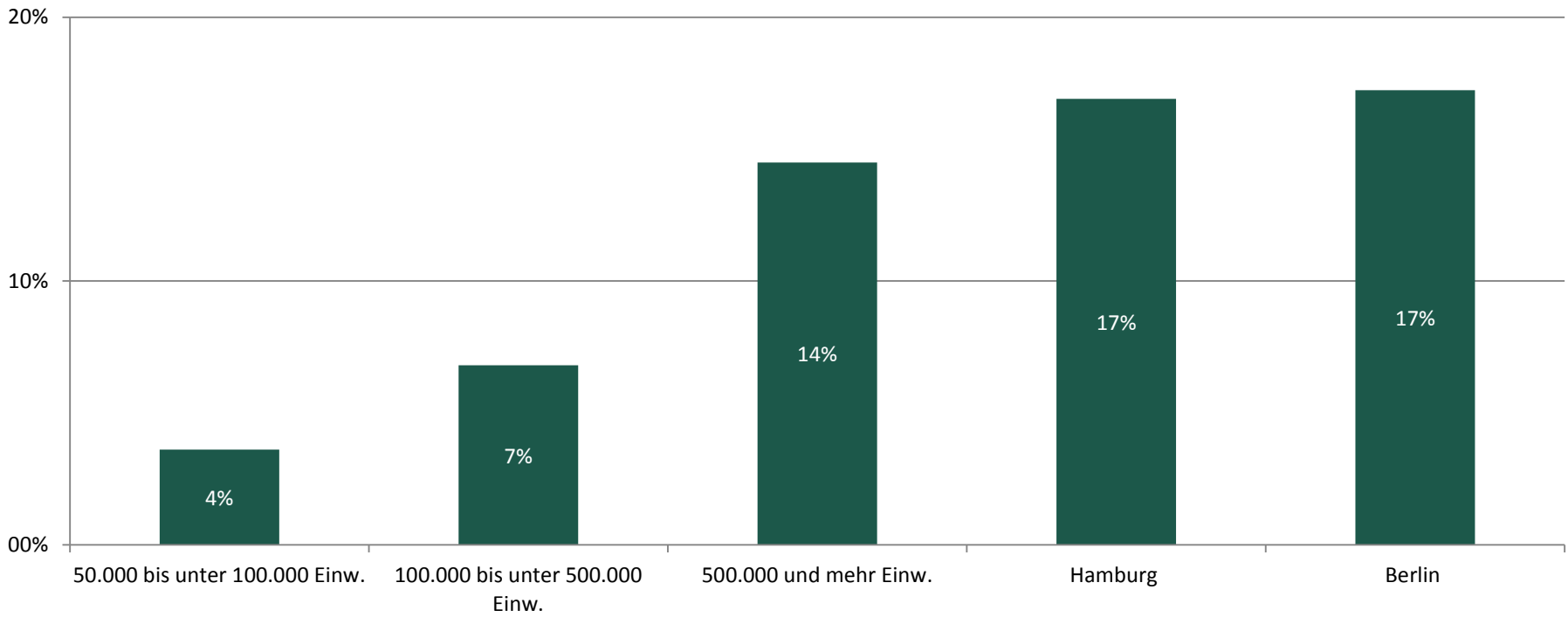
Hamburg



Tokyo

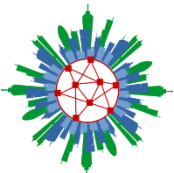


## Share of intermodal users in different cities

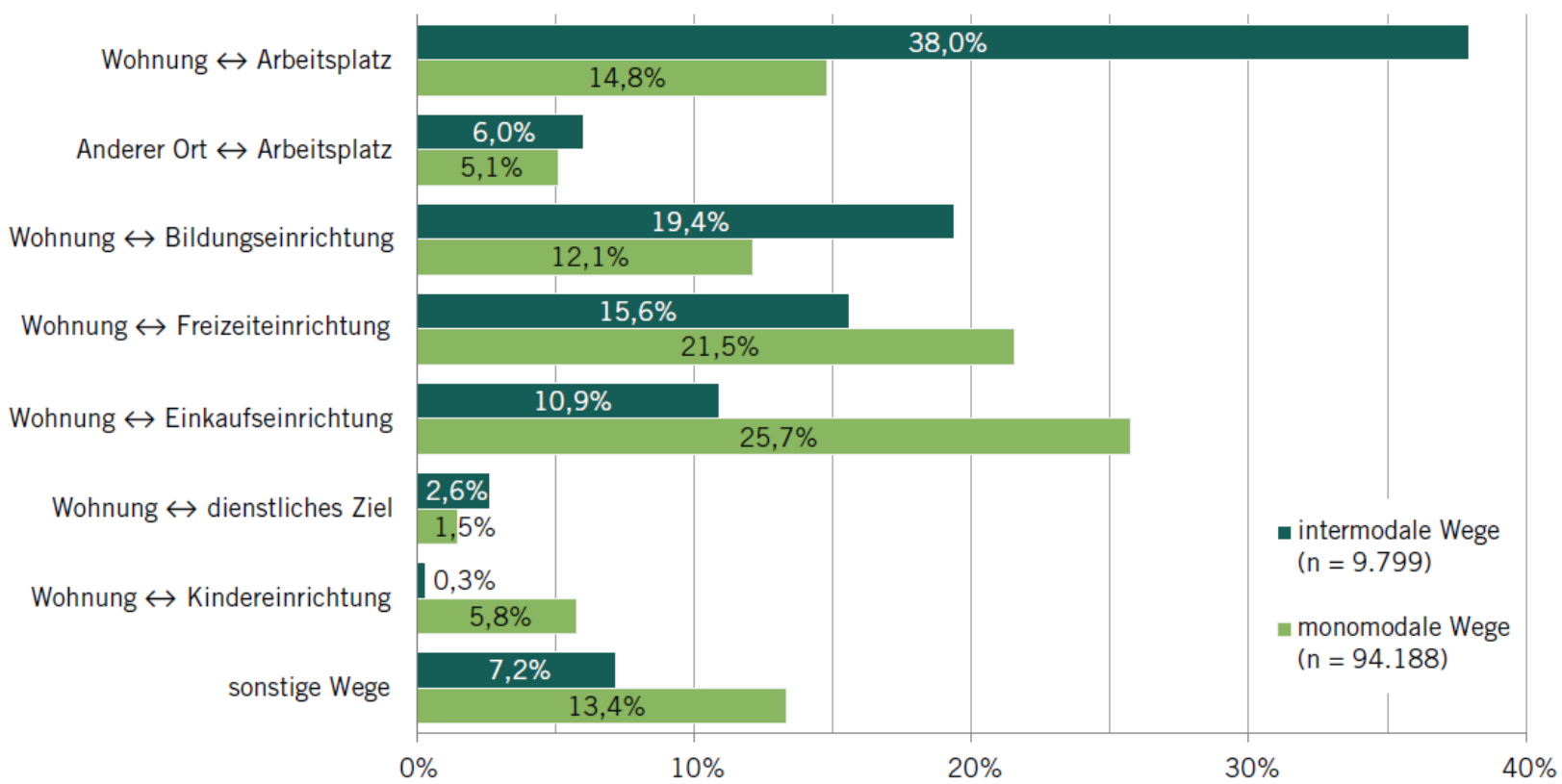


**intermodal persons** are persons who combine several means of transport on at least one everyday route

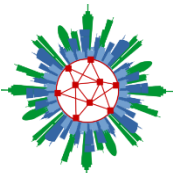
Source: DLR on basis of „Mobilität in Städten – SrV 2008“, Stichprobe Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt, Abteilung Verkehr.



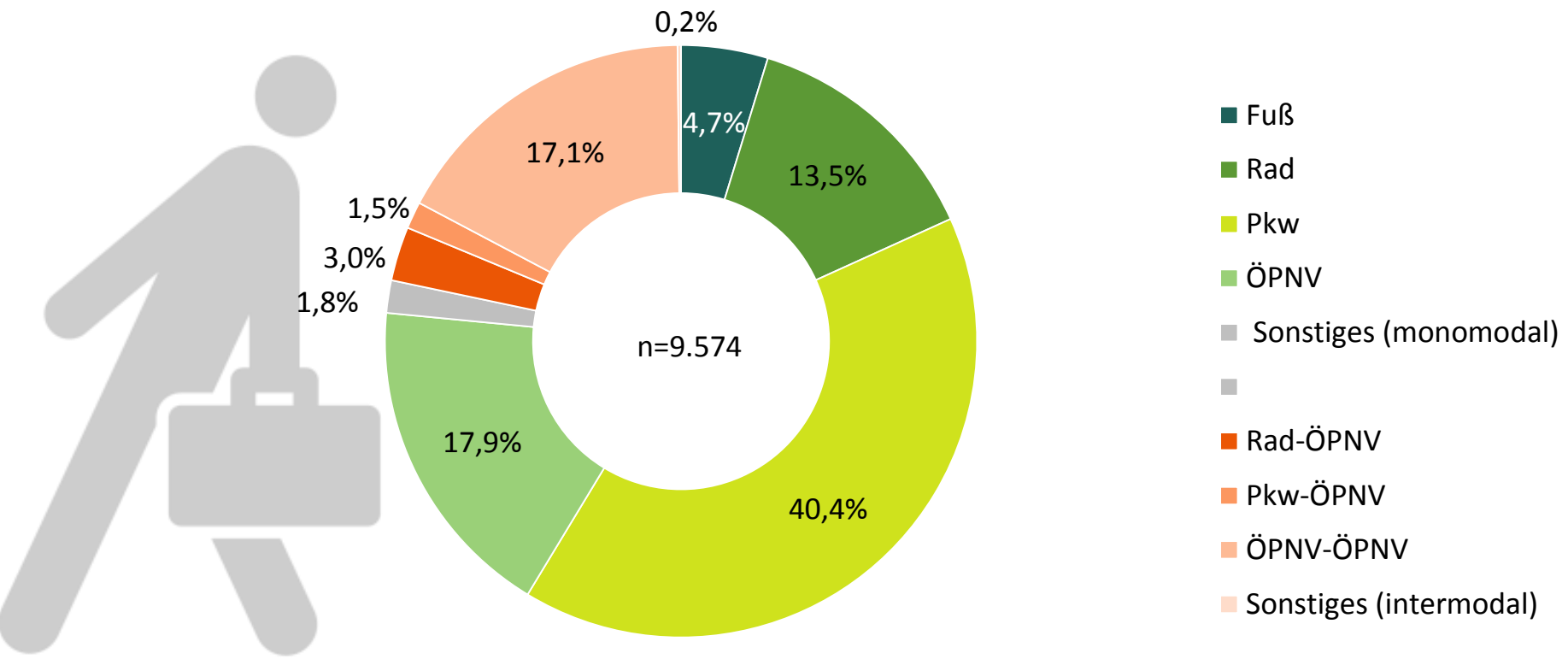
## ■ Intermodal ways are routine ways



Source: DLR on basis of „Mobilität in Städten – SrV 2008“, Stichprobe Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt, Abteilung Verkehr.

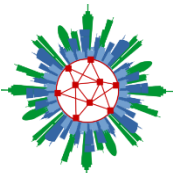


■ Intermodal way to work is dominated by public transport

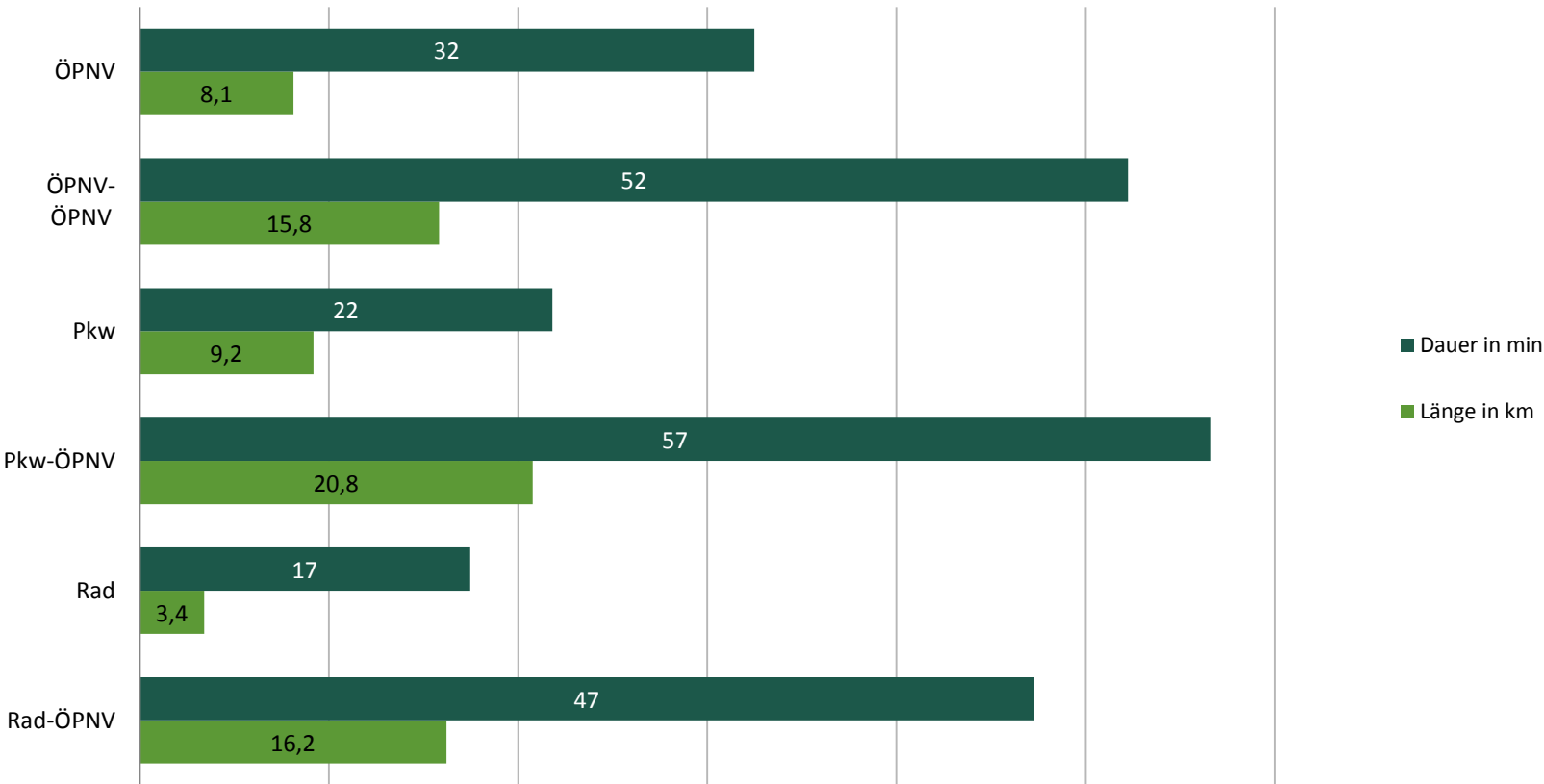


Source: DLR on basis of „Mobilität in Städten – SrV 2008“, Stichprobe Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt, Abteilung Verkehr.

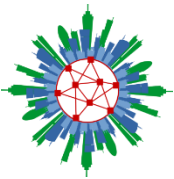




■ Intermodal ways are longer and take more time



Source: DLR on basis of „Mobilität in Städten – SrV 2008“, Stichprobe Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt, Abteilung Verkehr.



# Intermodality



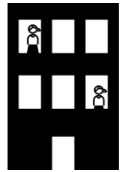
## ■ What do we know about intermodal persons?



- Are more female (55%)



- tend to have a high qualification (35% FH / university entrance qualification)



- Live rather in single households (18%)



- Have no or only few children

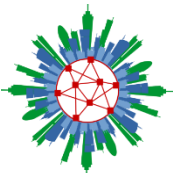


- Have limited access to own car and are using public transport long-term tickets

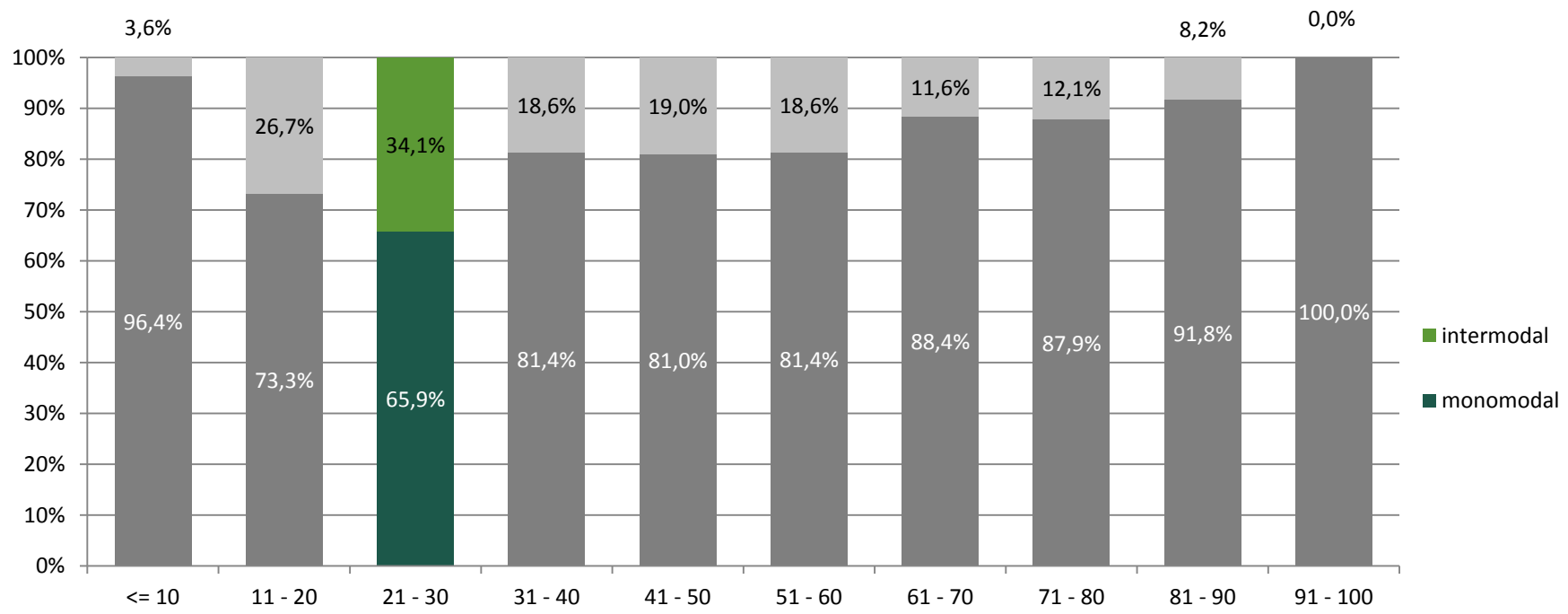
**21-30 J.**

- Are relatively young

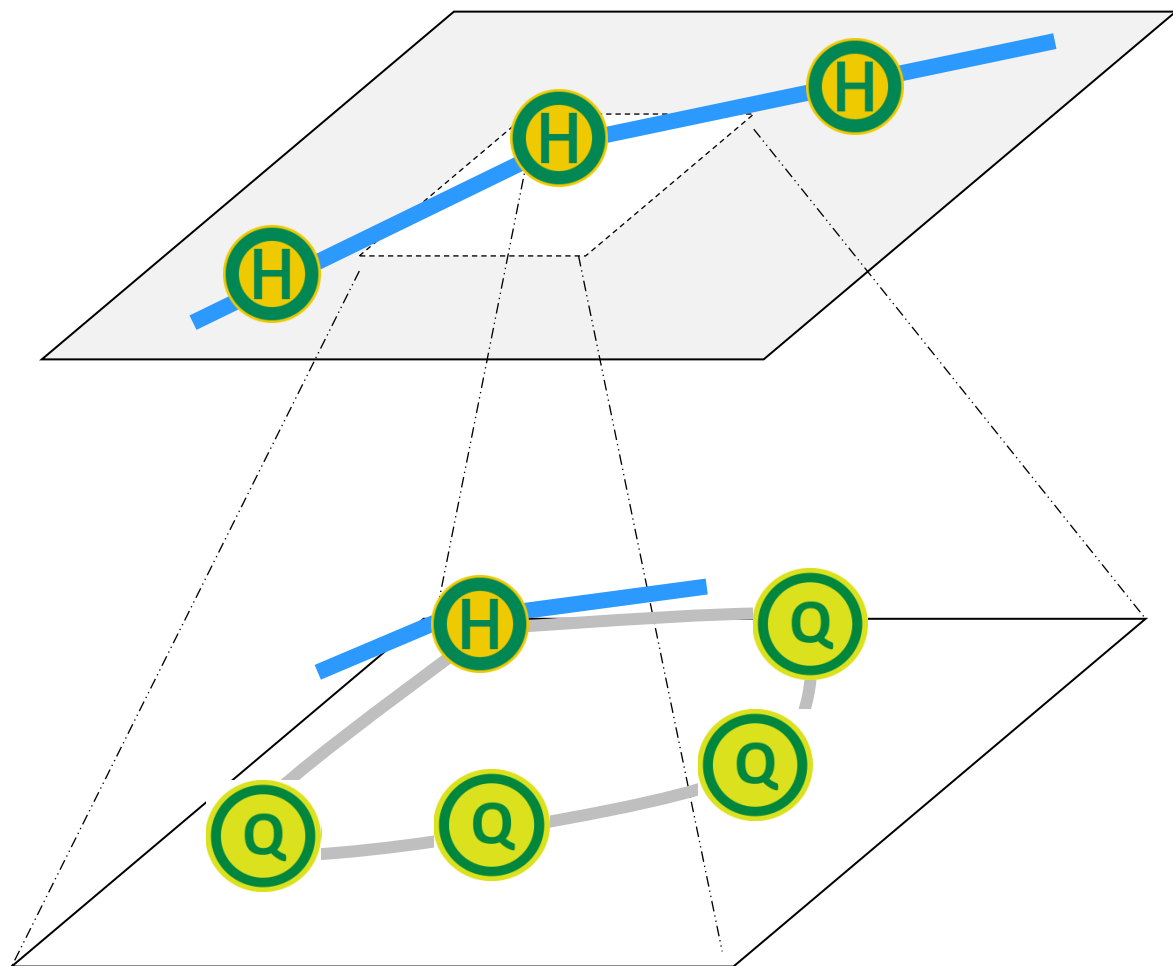
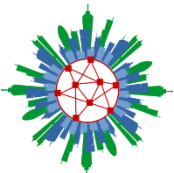
Source: DLR on basis of „Mobilität in Städten – SrV 2008“, Stichprobe Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt, Abteilung Verkehr.



## ■ Intermodal persons are relatively young

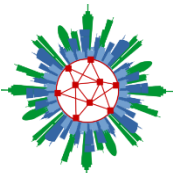


Quelle: Eigene Auswertungen auf Basis von „Mobilität in Städten – SrV 2008“, Stichprobe Berlin, Senatsverwaltung für Stadtentwicklung und Umwelt, Abteilung Verkehr.



**District Bus Service without fixed stops**

- Connected with „high-capacity public transport“
- Feeders and Removers to main traffic axes
- Passenger controlled information via App
- Laboratory demonstrator (communication passenger / control center / bus driver)



# Intermodal Mobility Concepts



- Laboratory demonstrator:

## Passenger

DLR Trip Details

- 3 min walk to pick-up
- 11:45 h pick-up at corner *Alte Kirchstraße/An d. Sporthalle*
- 11:48 h drop-off at *Salzdhahumer Str. 11*
- 4 min walk to destination

## Bus Driver

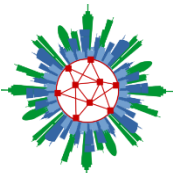
DLR Next Trip starting 11:40 h

Route has been updated  
Starting time has changed

Confirm

Show trip details Start navigation

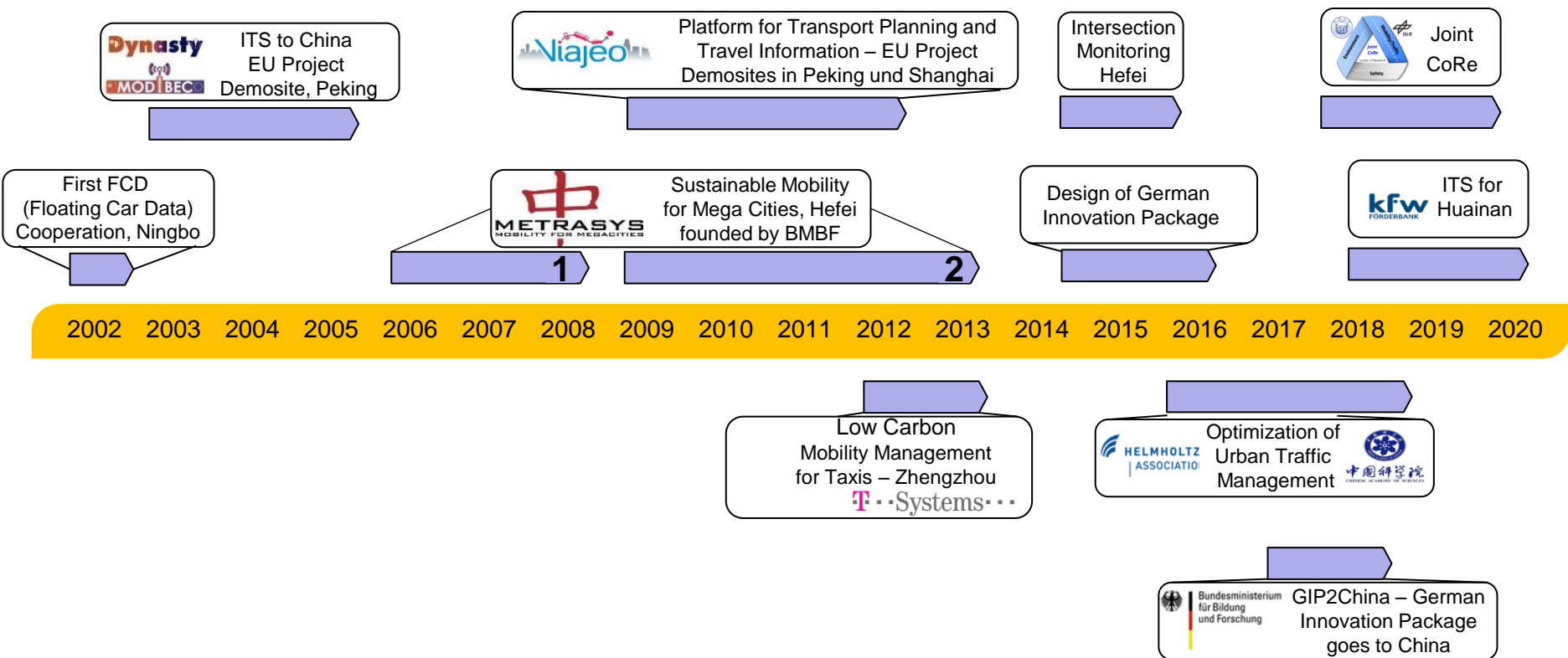


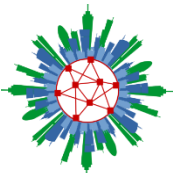


# Experiences from Cooperation with China



- DLR Institute of Transportation Systems has more than 15 years of project experiences in China

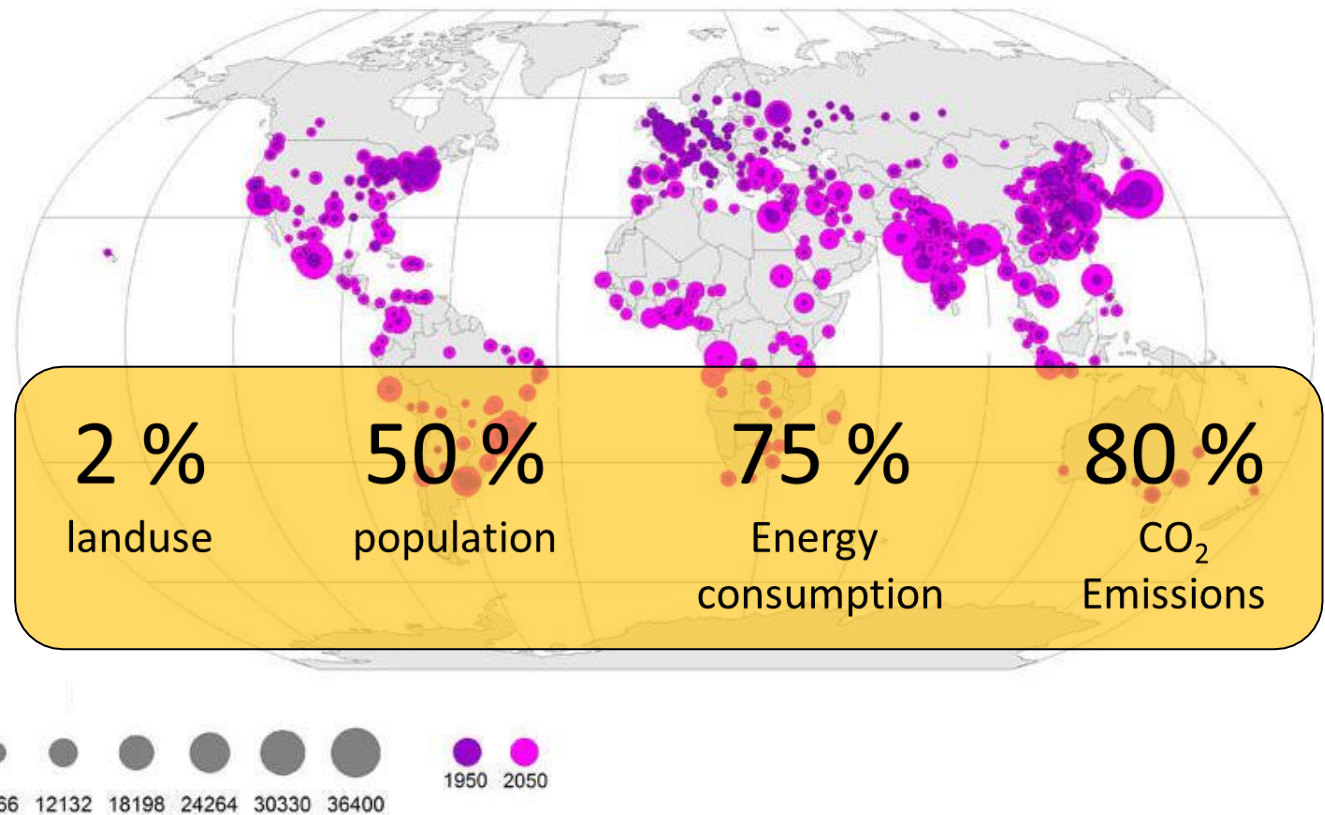




# Experiences from Cooperation with China



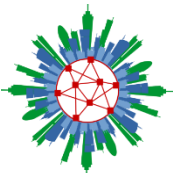
- Challenges of today's society



Source graphic :<http://www.laenderdaten.de/bevoelkerung/urbanisierung.asp>



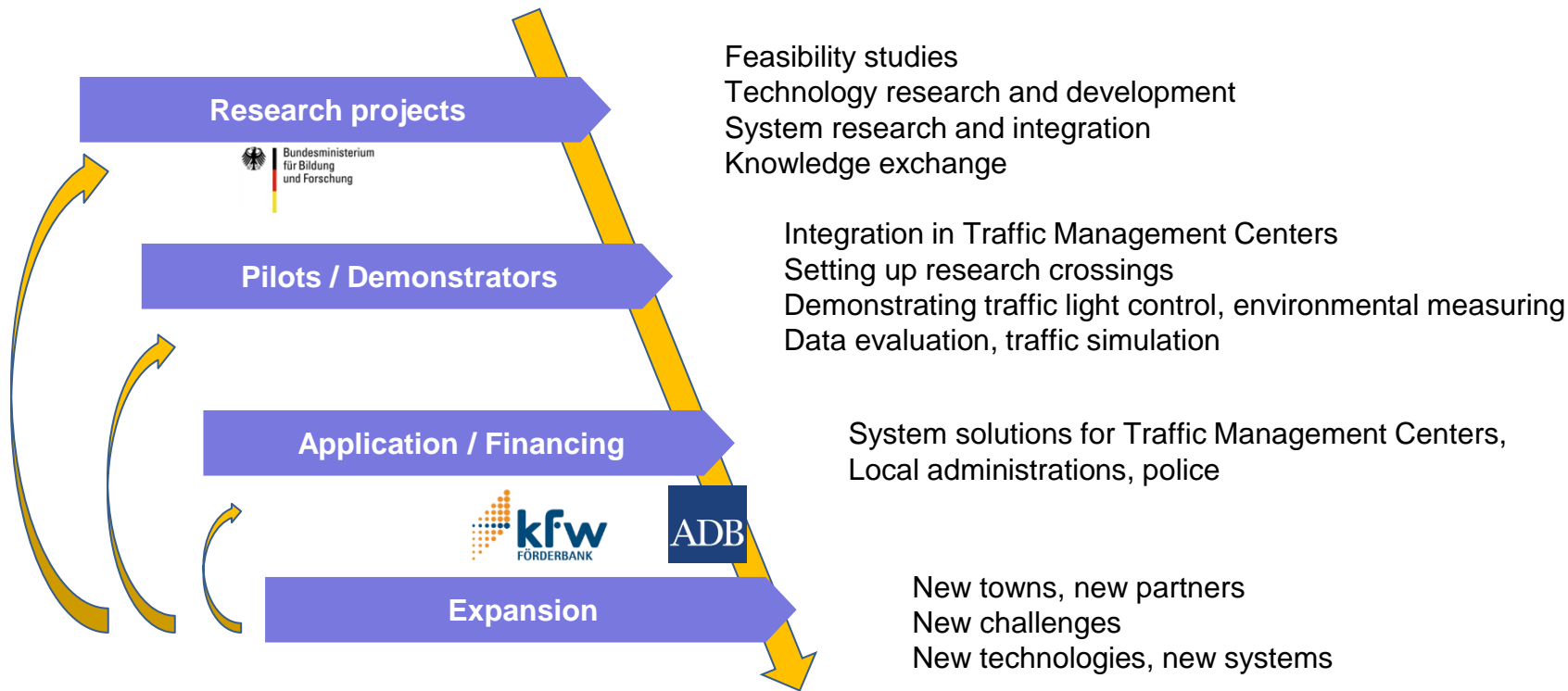
Research in Germany  
Land of Ideas



# Experiences from Cooperation with China

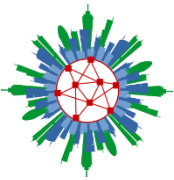


## ■ From research to application



Research in Germany  
Land of Ideas





# Experiences from Cooperation with China

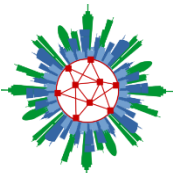


- Focus:
  - **Transport and Mobility** interacting with
    - **Environment**
    - **Safety**
    - Logistics
    - City systems
    - City development
    - health



Bundesministerium  
für Bildung  
und Forschung

Research in  
Germany  
  
Land of Ideas



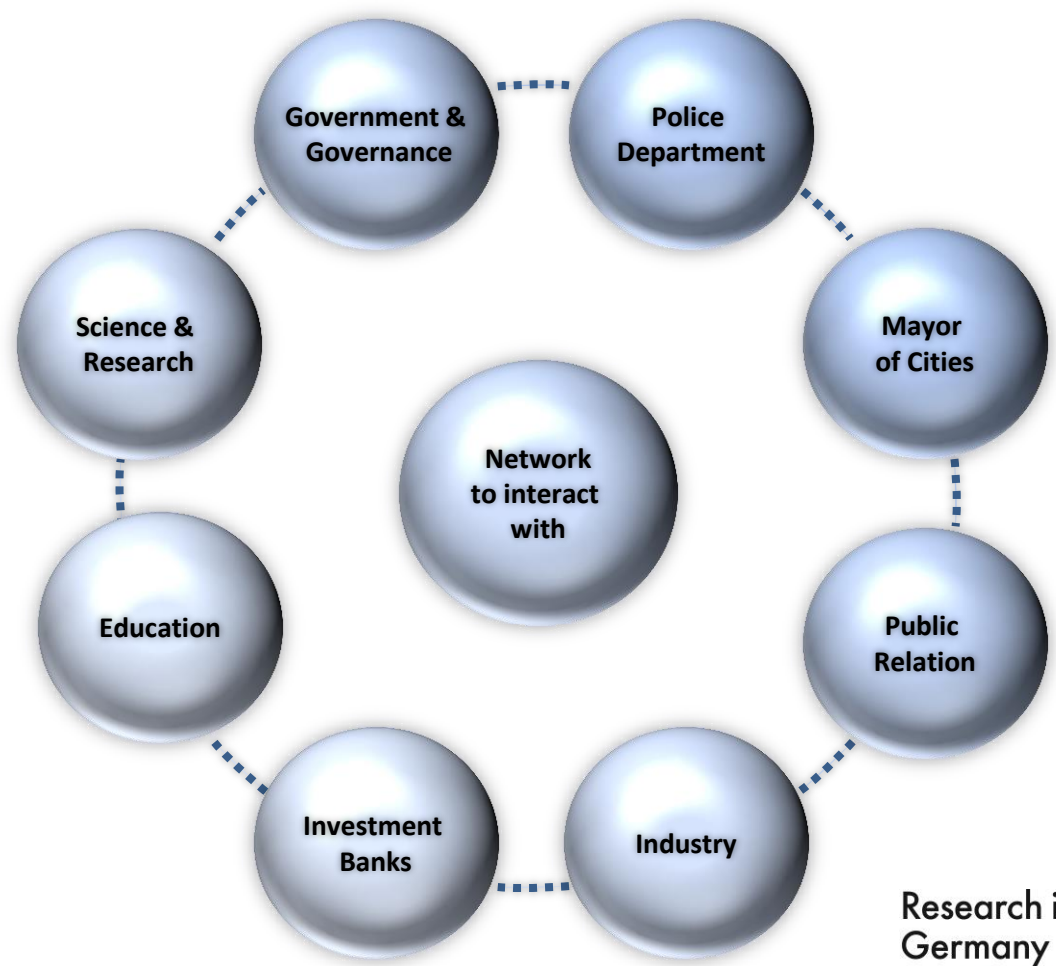
## ■ Network Structure

### ■ Cooperation and exchange in:

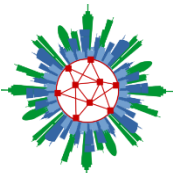
- Science
- Research
- Education
- Application
- Development

### ■ Common interests / projects:

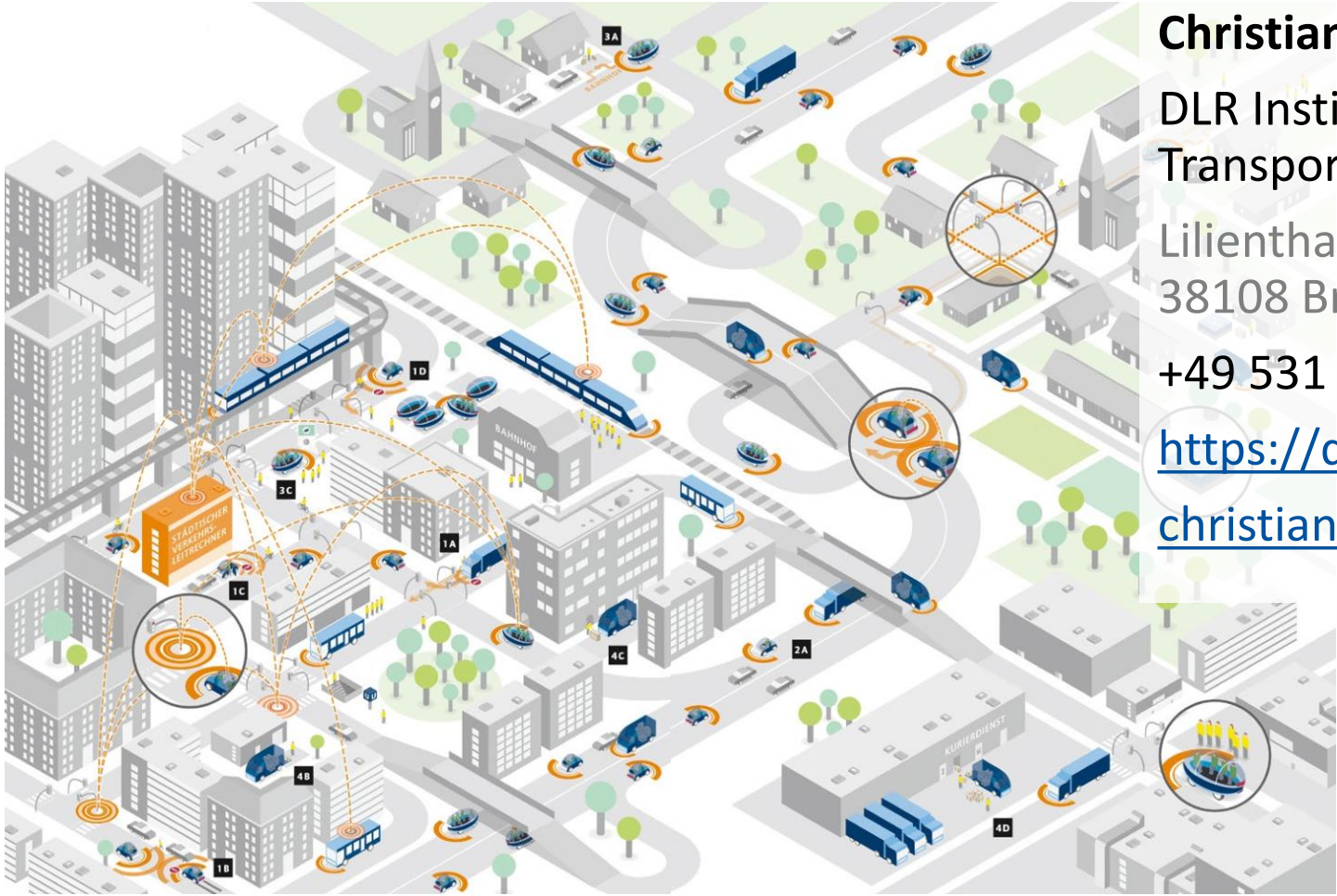
- Analyses
- Development of future scenarios
- Implementation of new technologies and methodologies
- **Application oriented**
- **System oriented**
- **Solution oriented**







Thank you for your attention!



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(Quelle: acatech, 2016)