SPATIAL EFFECTS OF ALTERNATIVE DELIVERY CONCEPTS

Case study on parcel delivery with cargo bikes

Cities for mobilities, Stuttgart

June 21st, 2016

Universität Stuttgart
Institut für Arbeitswissenschaft und Technologiemanagement IAT

Fraunhofer IAO

Overall goals of the survey

- Showing the **interdependencies of urban logistic processes and their impacts on public space** at a concrete use-case (delivery bicycle)
- **Creating the basis** for an **objective and solution-oriented discussion** about inner-city logistics among involved actors
- **Giving an impetus to get a wider perspective** of inner-city logistic processes in the context of city planning in order to
  - **be able to evaluate and locate** the potentials of alternative logistic concepts.
  - facilitate **differentiated solutions for diverse urban settings**

Focus of observation

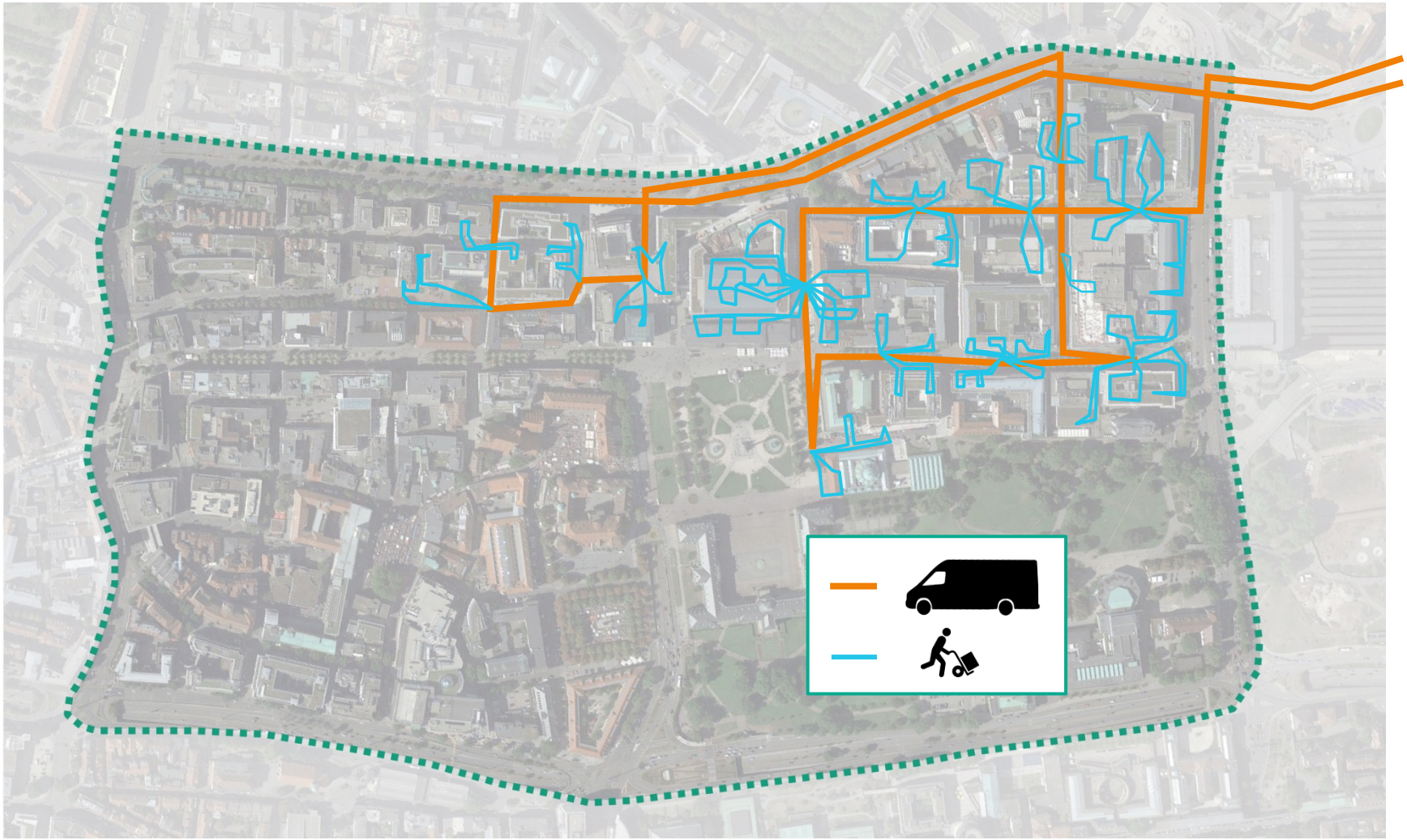
- **The inner-city of Stuttgart** (area between the main station – Theodor-Heuss-Str. – Rotebühlplatz – Eberhardstraße - Planie)
- **Parcel delivery** (courier-, express-, parcel-services)
  → **2 companies**

Research questions:

- Which are the requirements for parcel delivery within the inner-city of Stuttgart with cargo bikes?
- Which changes arise for existing processes?
- Which positive or negative impacts are to be expected?
- Which requirements arise for the public space?

Conventional package delivery in the examined area

Exemplary route by delivery van



Conventional package delivery in the examined area

Accompanied trip at DHL in the inner-city of Stuttgart

Conventional package delivery in the examined area

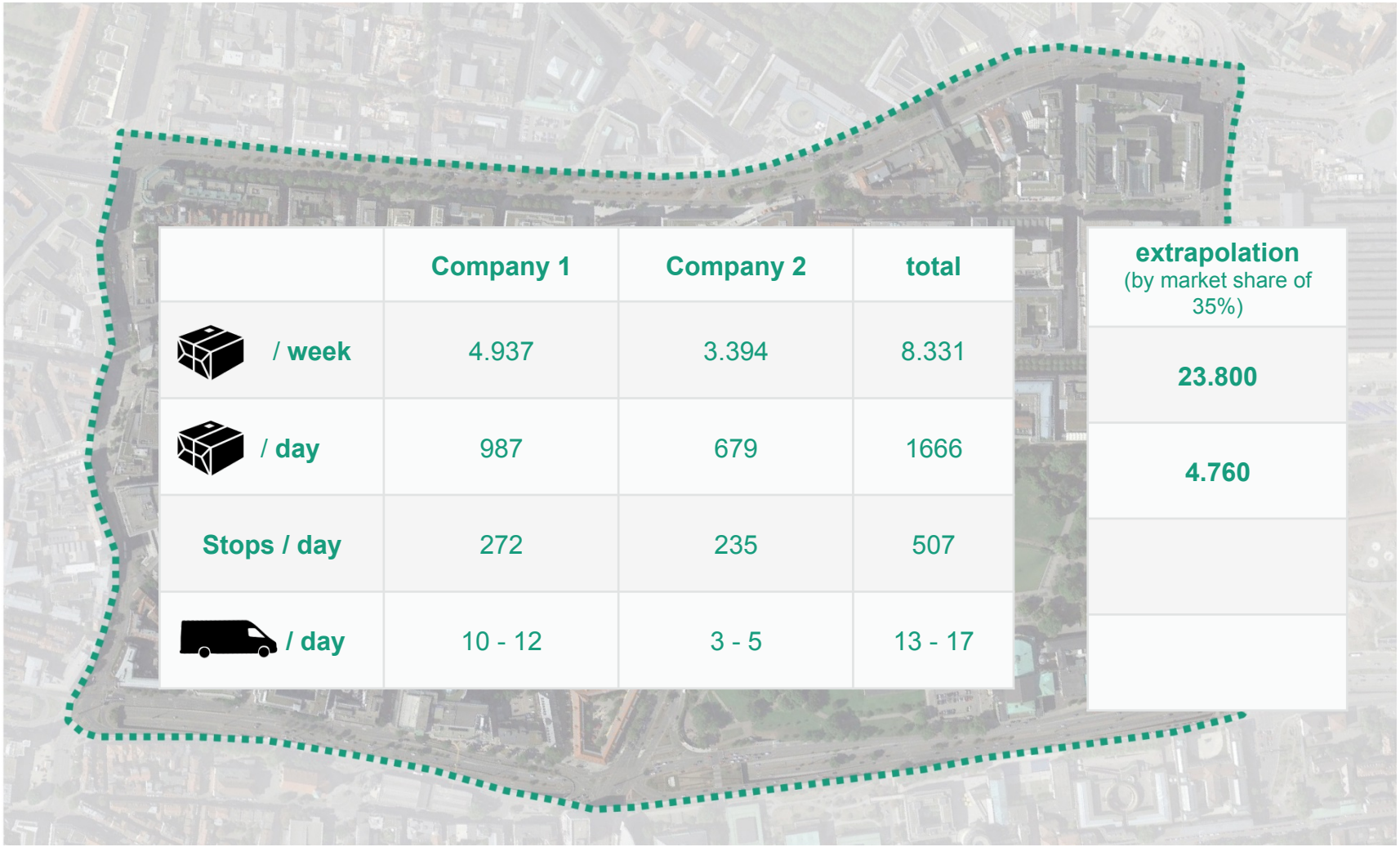
Accompanied trip at UPS in the inner-city of Karlsruhe

Universität Stuttgart
Institut für Arbeitswissenschaft und Technologiemanagement IAT

Fraunhofer IAO

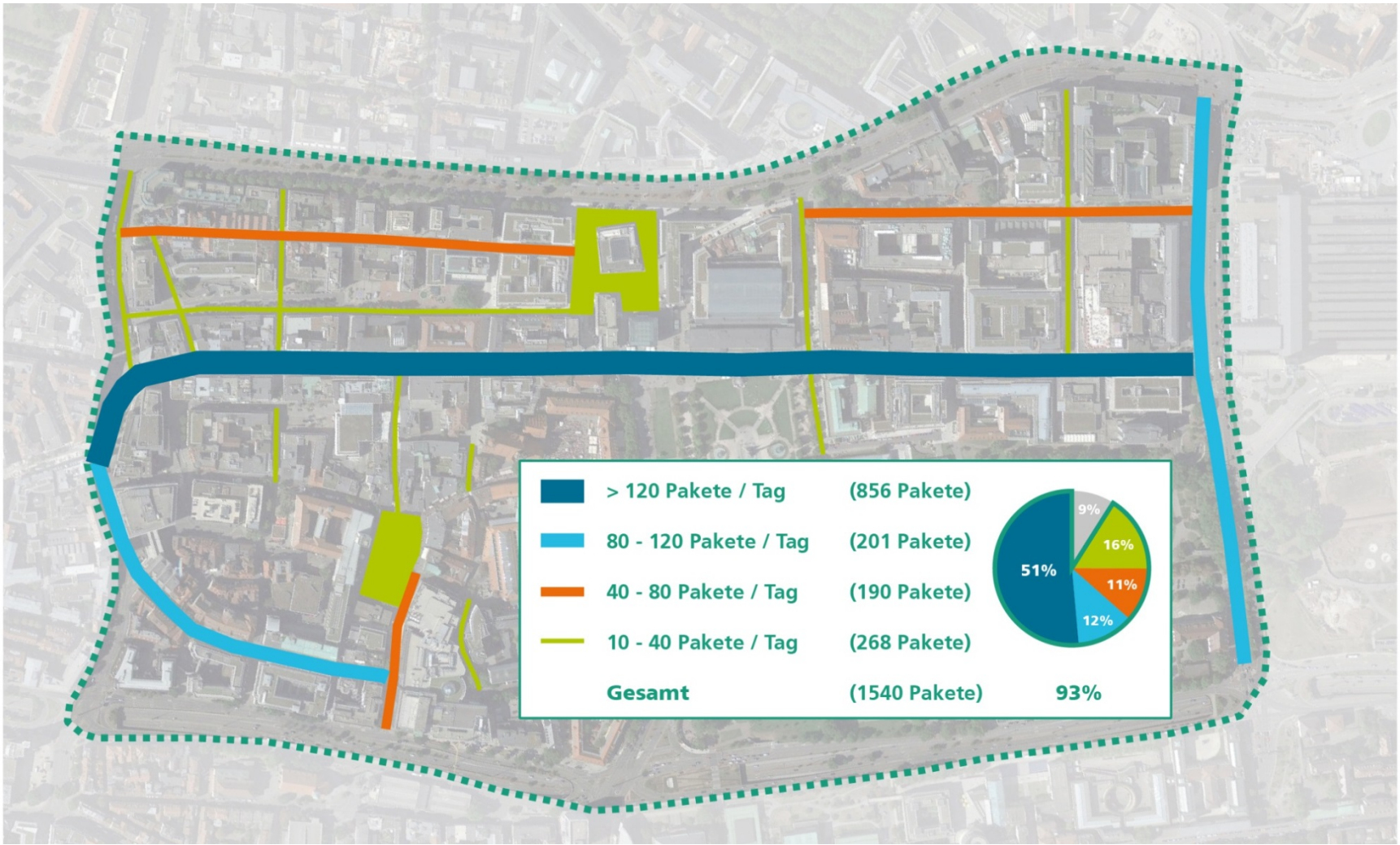
Surveyed data

Parcel amount in the examined area



	Company 1	Company 2	total	extrapolation (by market share of 35%)
/ week	4.937	3.394	8.331	**23.800**
/ day	987	679	1666	**4.760**
Stops / day	272	235	507	
/ day	10 - 12	3 - 5	13 - 17	

Surveyed data
Parcel distribution in the examined area



Surveyed data
findings

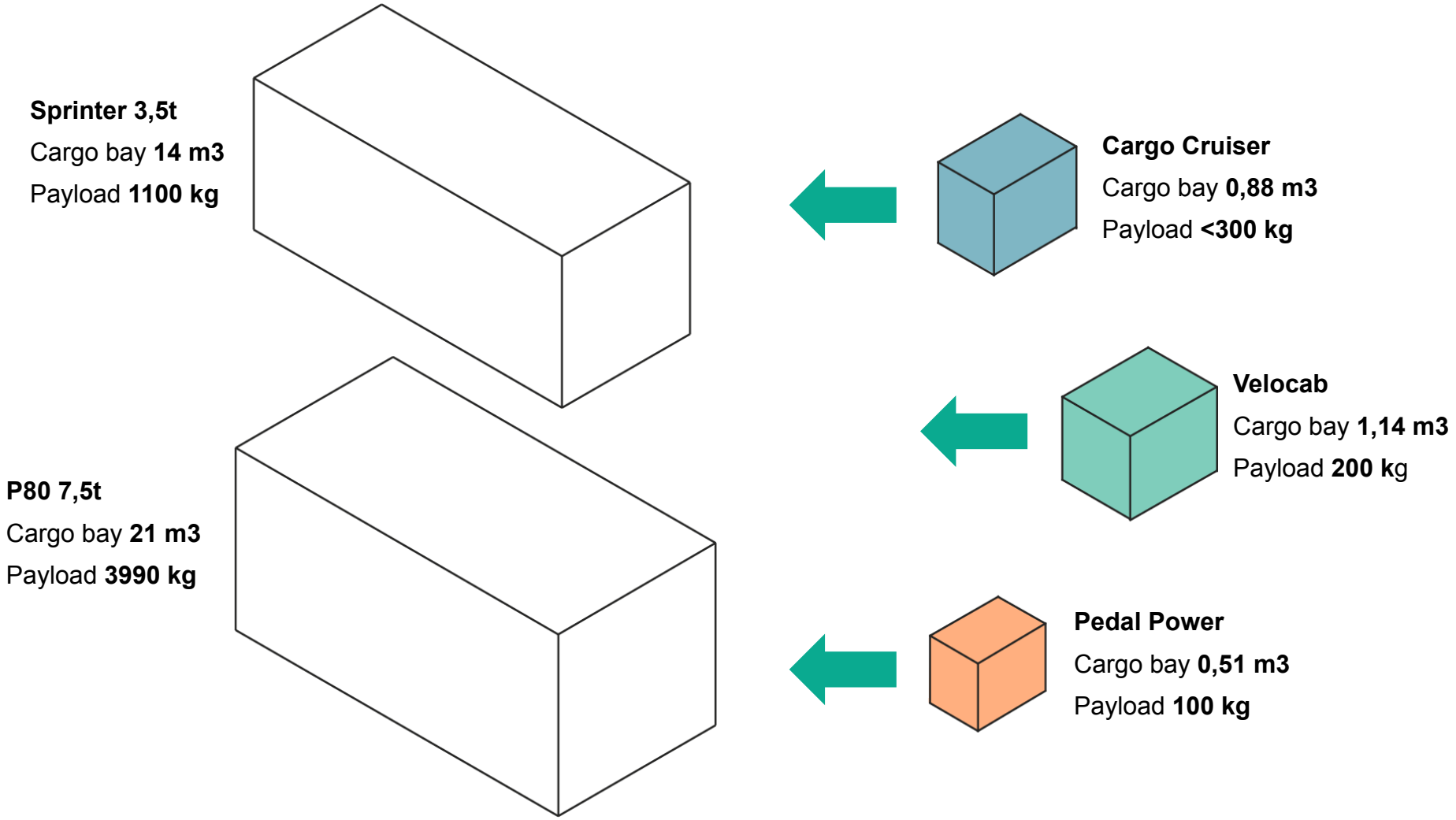
- Possible **leverage points for innovative logistic solutions can be well located** on the last mile:
  - Ca. 50% of the parcels are delivered in the Königstrasse, ca. 25% in 5 further streets
- Through **directed measures** on this areas **75% of the whole parcel amount** can be covered**.**
- Both companies have a **similar parcel distribution.** I.e. there can be developed **“supplier-neutral” solutions**
- The examined companies have a **market share by parcel amount of 35% in the inner-city of Stuttgart** together.
  - The findings can be seen as **representative**
  - There can be expected a **big leverage by collaborating with bigger companies**

Alternative parcel delivery by delivery

typical delivery vehicles and bicycles for inner-city parcel delivery

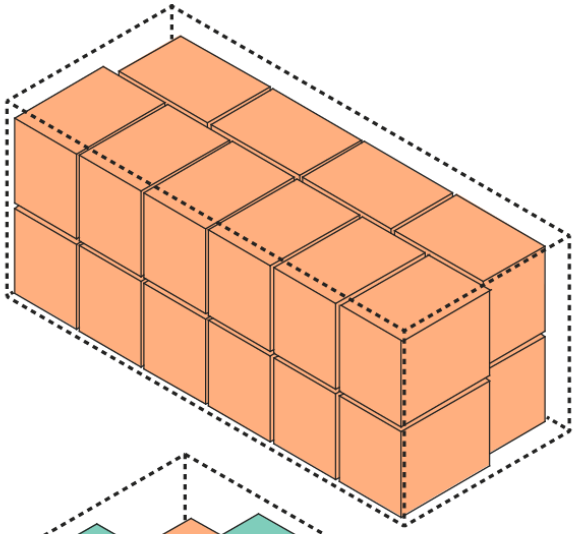
Alternative parcel delivery by delivery bicycles

comparison of cargo bay capacity: Van/delivery bicycle



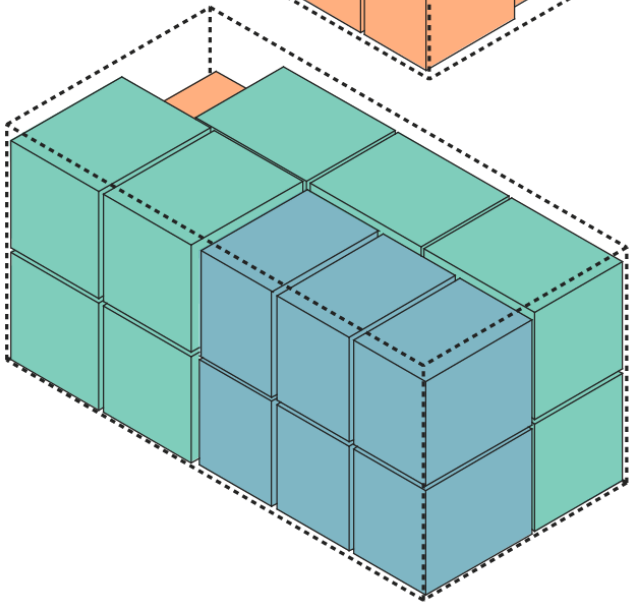
Alternative parcel delivery by delivery bicycles

comparison of cargo bay capacity: Van/delivery bicycle



20 x

10 x



6 x

2 x

Alternative parcel delivery by cargo bikes

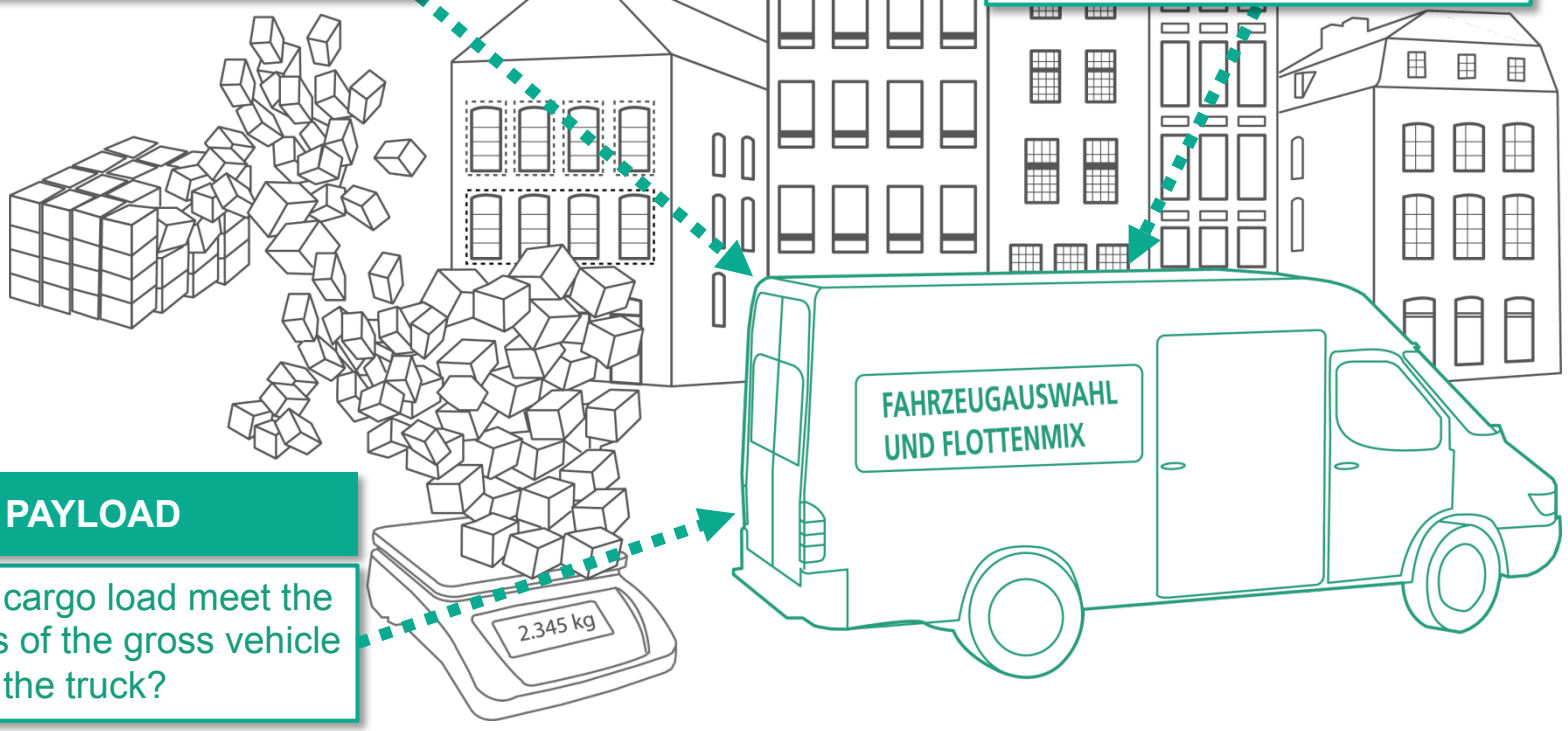
bottlenecks at disposition and route-planning

VOLUME

How many parcels fit into the load compartment?
Is there a need to reload?

TIME

How many recipients are on the tour?
How long are the distances between the adresses?



PAYLOAD

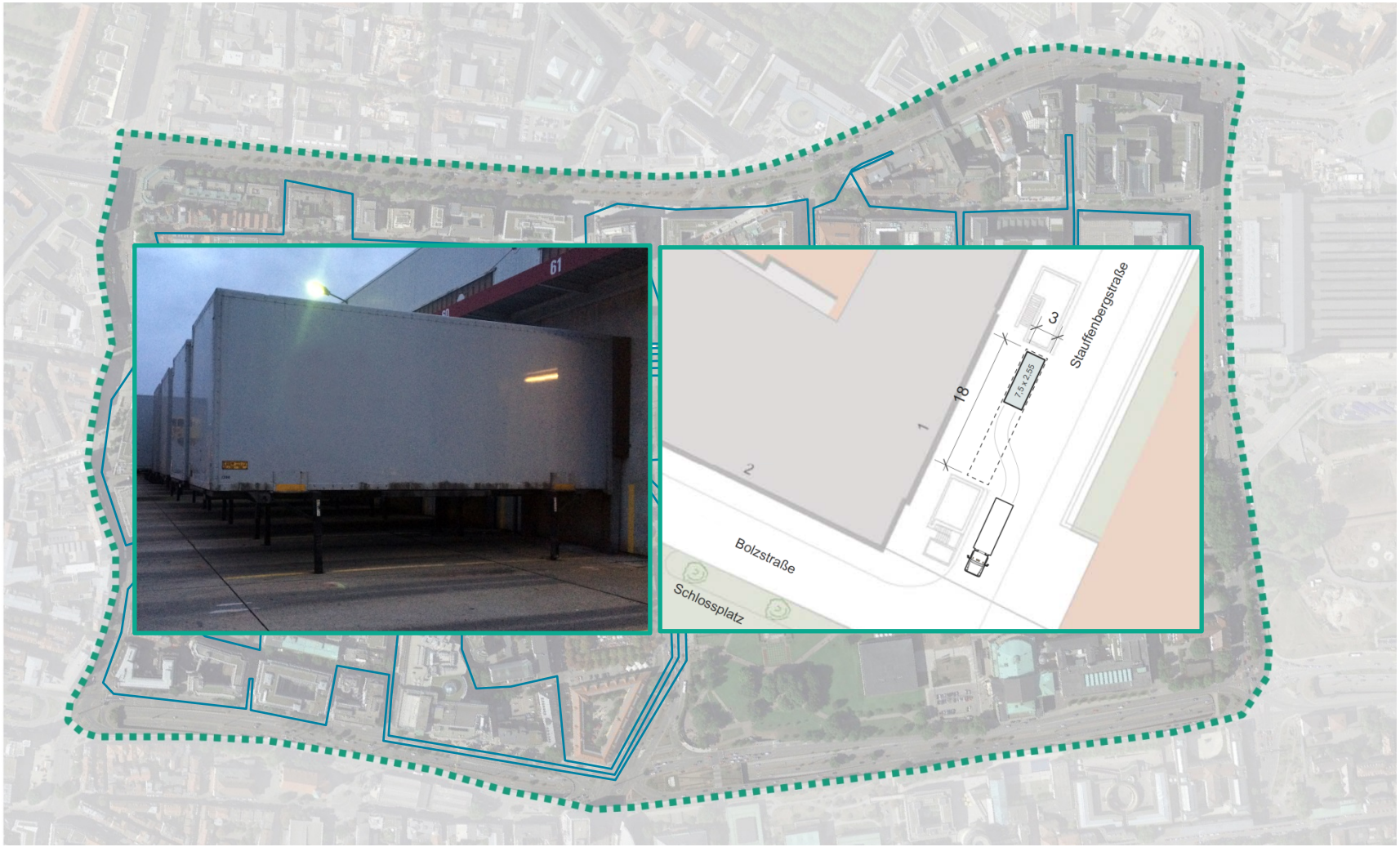
Does the cargo load meet the limitations of the gross vehicle weight of the truck?

Company 2 - delivery bicycle concept Stuttgart
Company 2 – process

- **Loading** of the container at the depot outside the city
- **Transport and placing** of the container(s) in the inner-city between 8-9 am
- **Parcel delivery and pick-up** by delivery assistants with hand trucks and conventional or electric cargo bikes
- **Pick-up and transport** of the container to the depot at ca. 7 pm

Company 2 - delivery bicycle concept Stuttgart

Model I: central parcel depot with 4 delivery bicycles



Company 2 - delivery bicycle concept Stuttgart

Model II: 2 parcel depots with each 1 delivery bicycle + 1 hand truck

Company 2 - delivery bicycle concept Stuttgart

Model III: 4 parcel depots with each one hand truck

Company 2 – cargo bike concept Stuttgart
Urbanistic requirements

- Depending on model **1-4 urban transshipment areas** are needed (1 x 54qm, 2 x 12qm, 4 x 12qm)
- These have to fulfil following conditions:
  - **aerial, ranking space** for 7,5t-truck or trailer truck
  - The areas must be disposable **from 9 am till 7 pm** on weekdays
- **Parking space for cargo bikes** protected from weather and vandalism near by the transshipment area (e.g. public underground parking)
- If applicable **loading infrastructure for electric cargo bikes**

Company 2 - delivery bicycle concept Stuttgart
Which impacts are expected?

- Company 2 could replace up to **3 of 4 delivery vehicles** (7,5t) **by cargo bicycles and hand trucks**
- **One vehicle** still has to deliver parcels which don´t fit into cargo bikes in terms of volume and weight. **This vehicle cannot be replaced**
- There is no additional traffic volume arising from the transport of containers, because they are moved by vehicles which head to the city anyway.
- There will be **an overall-increase of tour-distance and empty runs** due to the use of cargo bikes (additional routes to reload parcels)
- The **delivery time frames also increase**
- There might be an **increase of personnel requirements** for logistic companies

Conclusion

- Innovative solutions for last mile delivery have a **big potential for Stuttgart**
- The use of cargo bikes is one possible concept with specific pros and cons, that has to be tested
- There is **no standard solution working** for each city or district
- **Specific logistical requirements of different areas of the city and alternative approaches for solutions** must be viewed in a differentiated way.
- **An objective basis for discussion** is needed so that cities and companies will be able to collaborate and develop solution-oriented concepts which ideally create a win-win-situation for involved actors.

outlook

Examples for alternative logistic concepts for last mile delivery

Intermodal urban cargo concepts

Delivery by UAV‘s

Flexible street wagon train

„supplier-neutral“ box systems

„supplier-neutral“ packing stations

Small-sized delivery vehicles

Connectable hand trucks

Mobile/intelligent containers for incoming goods

Many thanks for your attention..

Fraunhofer IAO

Dipl.-Ing. Steffen Raiber

CT Urban Systems Engineering

Phone : +49-711 / 970-2333

E-mail: steffen.raiber@iao.fraunhofer.de

Fraunhofer IAO

Nobelstr. 12

70569 Stuttgart

…research and solutions for a sustainable world