School of Engineering

Sustainable and Efficient Mobility Infrastructure
Applied Research Perspectives

Institute of Sustainable Development
Prof. Dr. Maike Scherrer

Institute of Data Analysis and Process Design
PD Dr. Valerio de Martinis

School of Engineering

Platform Digital Mobility and Digital Mobility Lab

Focus personal mobility: SmartUrbanity

Focus freight mobility: Smart Urban Multihub

Institute of Sustainable Development
Prof. Dr. Maike Scherrer

Institute of Data Analysis and Process Design
PD Dr. Valerio de Martinis

School of Engineering

Platform Digital Mobility and Digital Mobility Lab

Interdisciplinlary Research into the mobility system

Institute of Sustainable Development
Prof. Dr. Maike Scherrer

Platform Digital Mobility and Digital Mobility Lab

- Planning, development and operation of traffic and transport systems must consider technological, social, economic and environmental requirements
- Value chain of the mobility system is at the centre of attention
  - Demand analysis
  - Product and price design
  - Evaluation of solutions in terms of sustainability and risk
- Integration of all modes of transport, including active transport
- Digital Mobility Lab for the necessary software environment (e.g., PTV Visum, PTV Vissim, MATSim, SimaPro, Anylogistix, sma+viriato)
  - Use in research
  - Use in teaching

School of Engineering

Focus personal mobility
SmartUrbanity

Institute of Data Analysis and Process Design
PD Dr. Valerio de Martinis

SmartUrbanity

Advancing 15-Minute Cities through Collaborative and Smart Urban Solutions

Corrado Muratori
Stephan Bütikofer
Valerio De Martinis

Digital Mobility Platform

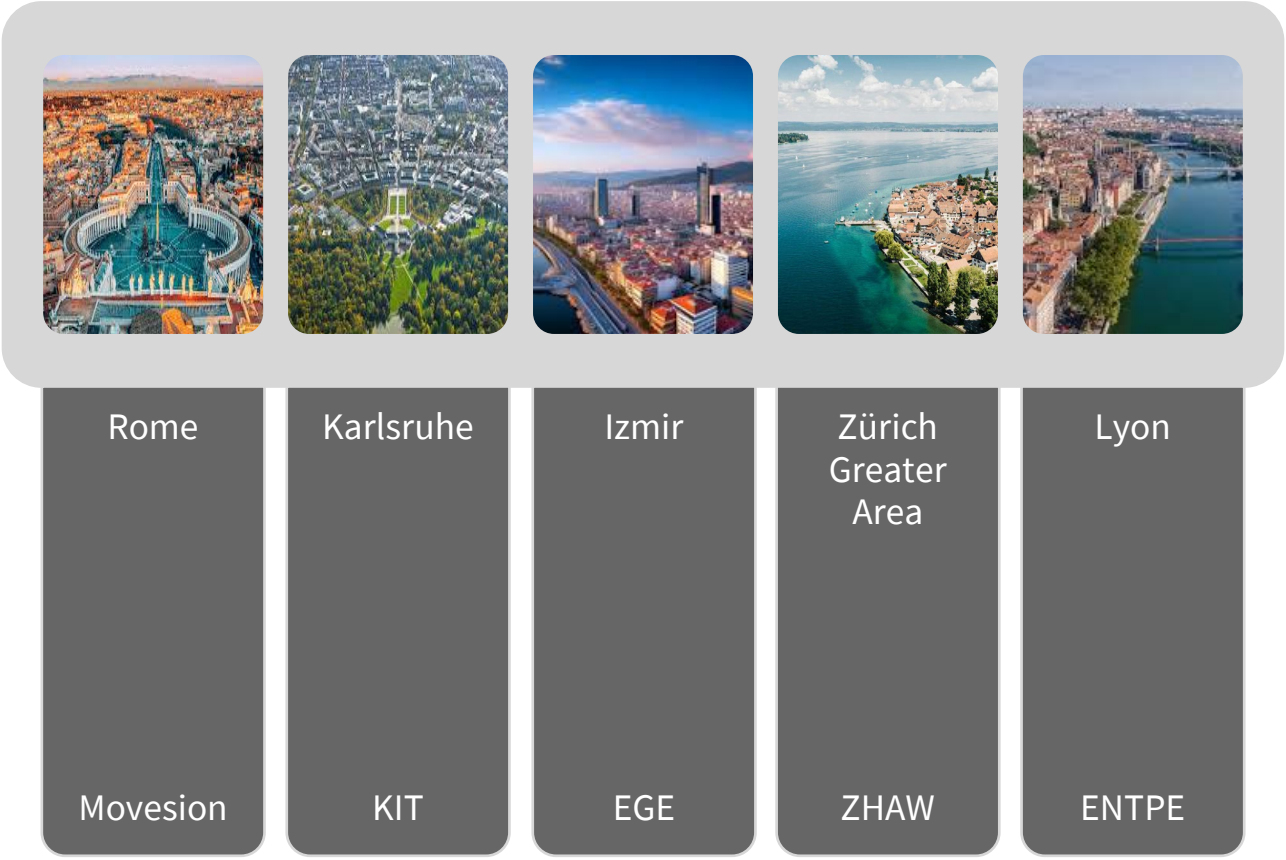
Partners

- UNIVERSITA' DEGLI STUDI DI ROMA LA SAPIENZA (Sapienza)
- MOVESION S.R.L (Movesion)
- CTLUP SRL (CTLup)
- MUNICIPIO XII ROMA CAPITALE (MXII)
- CONSULTA CITTADINA SICUREZZA STRADALE, MOBILITA' DOLCE e SOSTENIBILITA'
- HUN-REN SZAMITASTECHNIKAI ES AUTOMATIZALASI KUTATOINTEZET (SZTAKI)
- KARLSRUHE INSTITUTE OF TECHNOLOGY (KIT)
- KARLSRUHER VERKEHRSVERBUND (KVV)
- STADT KARLSRUHE – Civil Planning Office (STADT KARLSRUHE)
- EGE UNIVERSITY (EGE)
- IZMIR BUYUKSEHIR BELEDIYESI (IMM)
- Zurich University of Applied Sciences (ZHAW)
- PostAuto AG (PostAuto)
- Ecole Nationale des Travaux Publics de l'Etat (ENTPE)
- Métropole de Lyon (MGL)
- École Nationale Supérieure d'Arts et Métiers (ENSAM)

Project Volume (24M):	€	2,995,068.00
ZHAW funds from Innosuisse:	CHF	349,729.00

Digital Mobility Platform

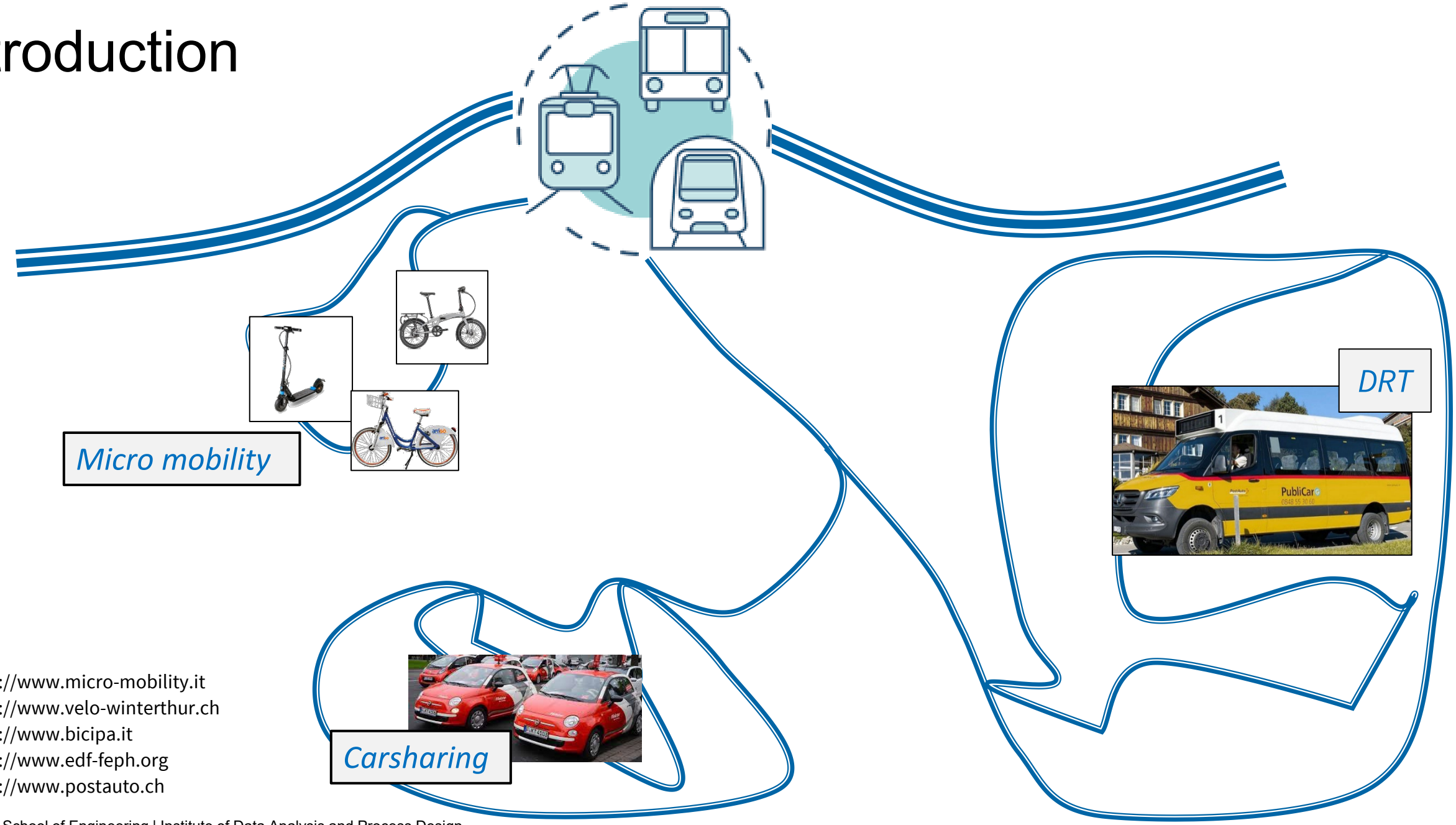
Pilots



ZHAW resposible for the pilot area

Aim:
Exploring hub-spoke demand-responsive PT (DRT) to link peripheral areas with high volumes public transit, aiding the 15-minute city concept.

Introduction



https://www.micro-mobility.it
https://www.velo-winterthur.ch
https://www.bicipa.it
https://www.edf-feph.org
https://www.postauto.ch

Our focus

Optimal Planning for Integrating On-demand Services with conventional Public Transport (PT)

Research gaps and research question

- No integration in the planning phase between frequency-based PT lines and On Demand transport services – no cost effective planning of both transport systems.
    - *How can we effectively plan both system in an integrated framework? Under which conditions can we define where and how these two systems coexist?*
- The implementation of current On Demand services is based on local experiences and knowlegde - No specific knowledge that identifies from data where it is most probable that an On Demand service can successfully be implemented
    - *Which are the main sources of information that identify potential areas for operating On Demand Services?*

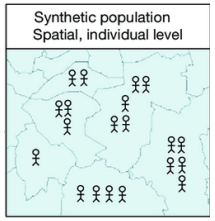
IVT ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

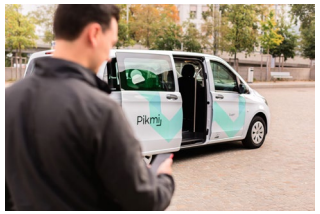
https://www.ivt.ethz.ch

MATSim Multi-Agent Transport Simulation

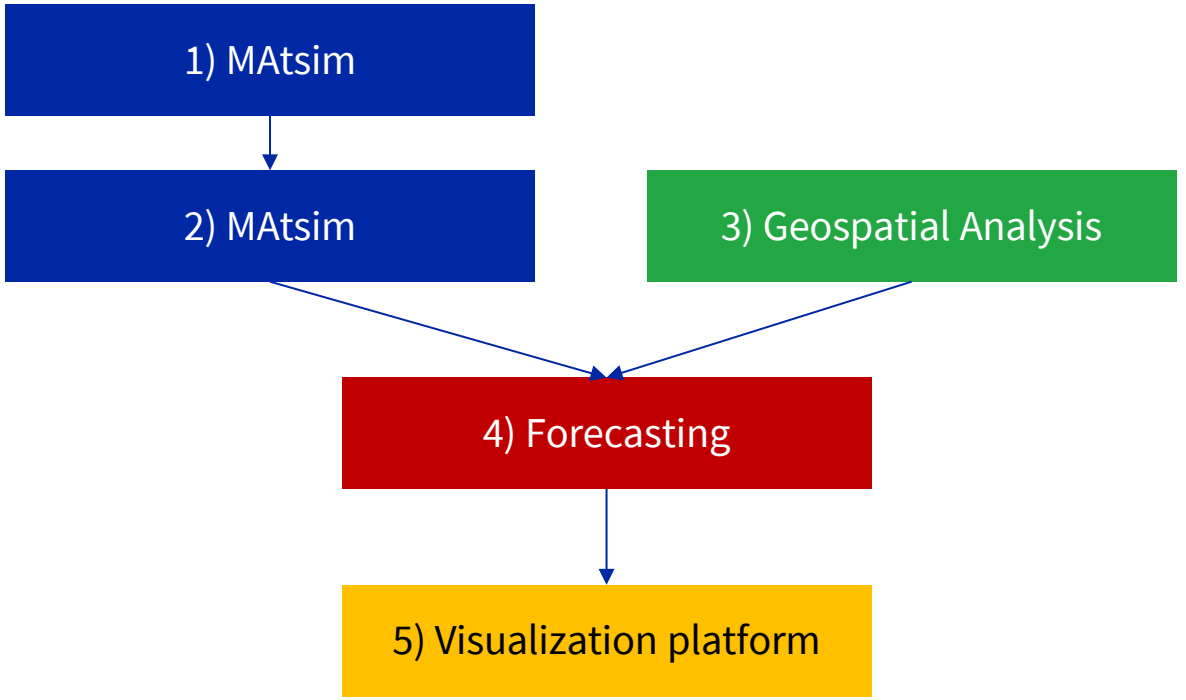
Data and methods

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra





https://www.ivt.ethz.ch



INPUTS

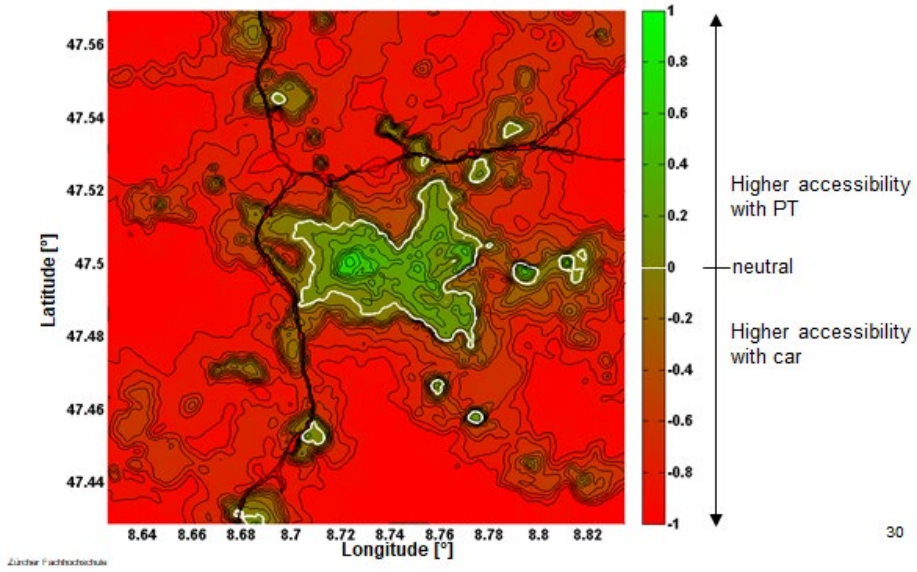
Syntethic population
Density
Accessibility
Infrastructure model
Current Modal Split

OUTPUTS
(DRT Simulation Performance)

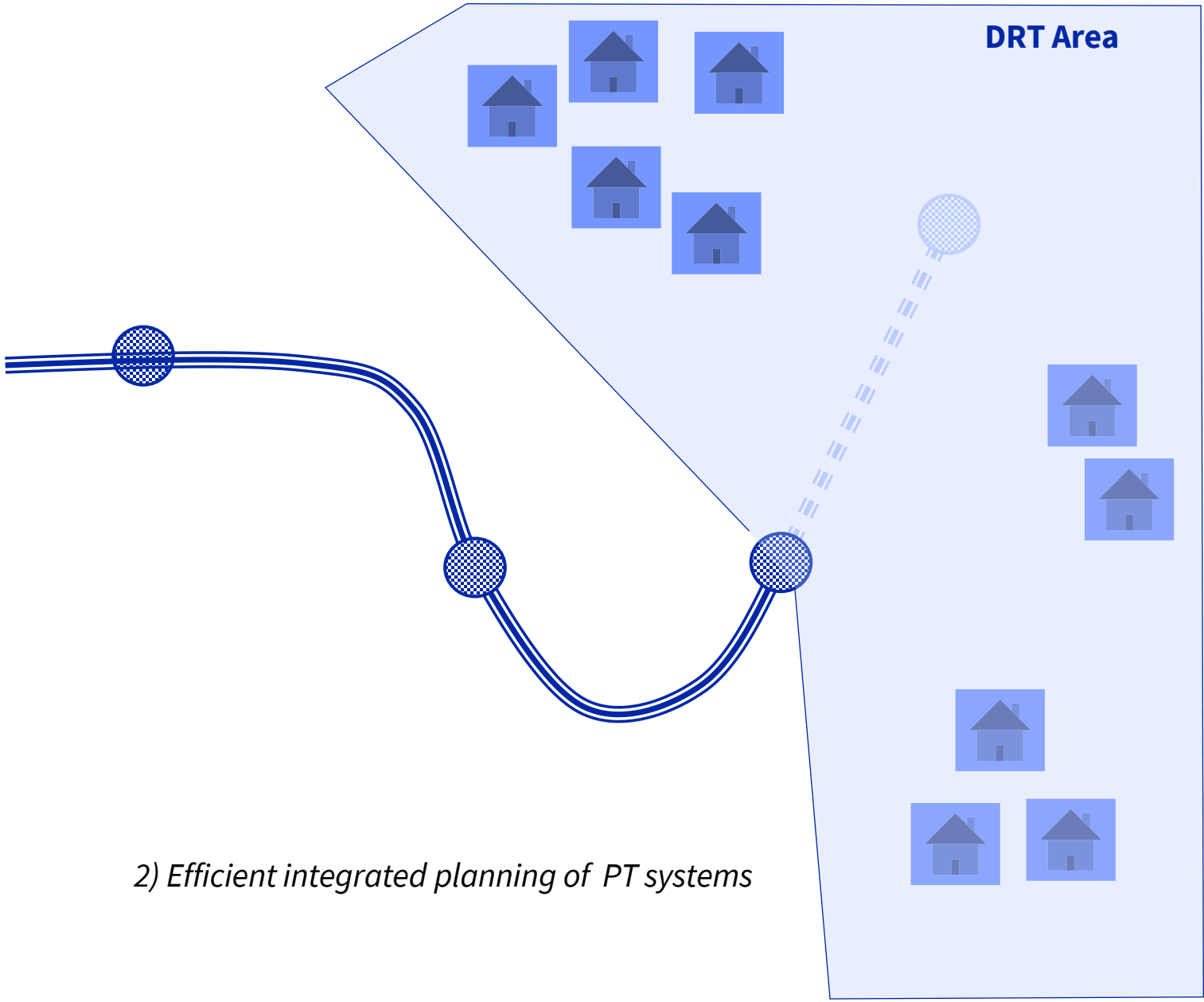
Impact on Modal split
DRT Total rides
PT total rides
Occupation rate on the PT lines

Expected output

GIS model on PT accessibility in rural areas



Modal accessibility gap between public transport (PT) and cars for the city of Winterthur. Trips to external cities, morning peak 07:00 to 08:00 (Steiner (2016)).



2) Efficient integrated planning of PT systems

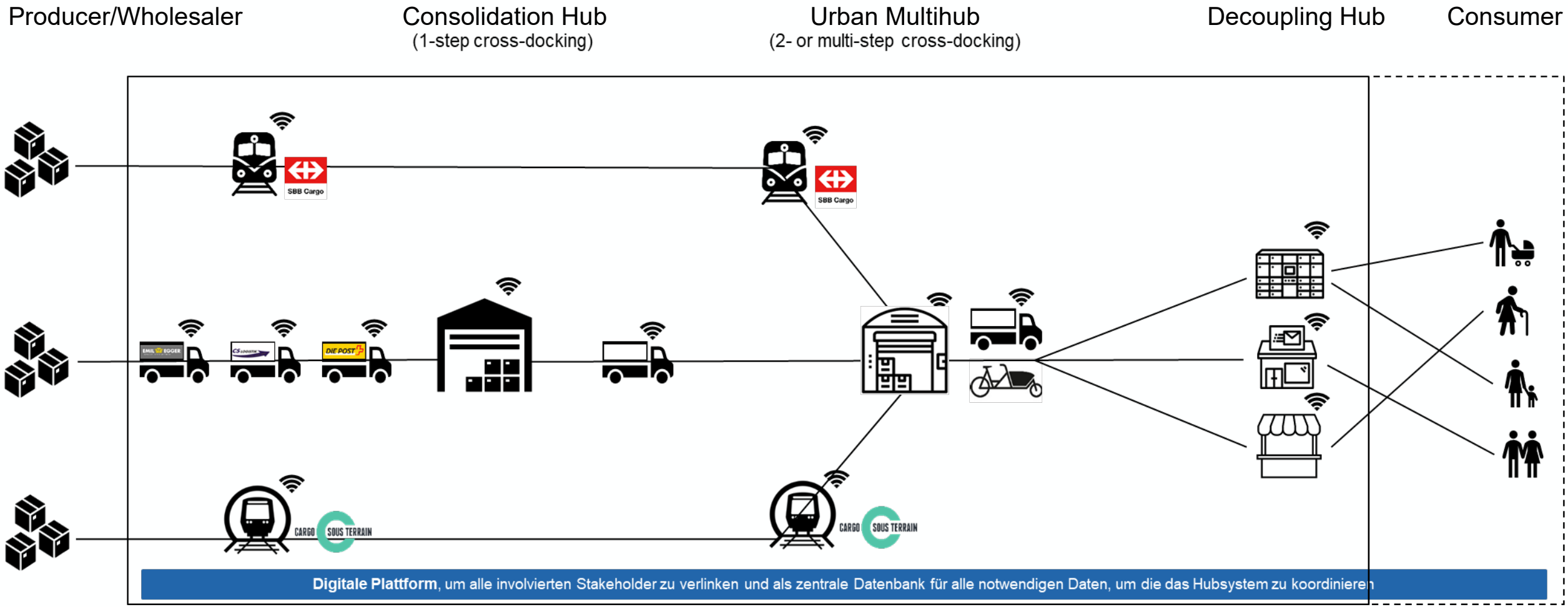
https://www.ivt.ethz.ch

School of Engineering

Focus freight mobility
Smart Urban Multihub Concept

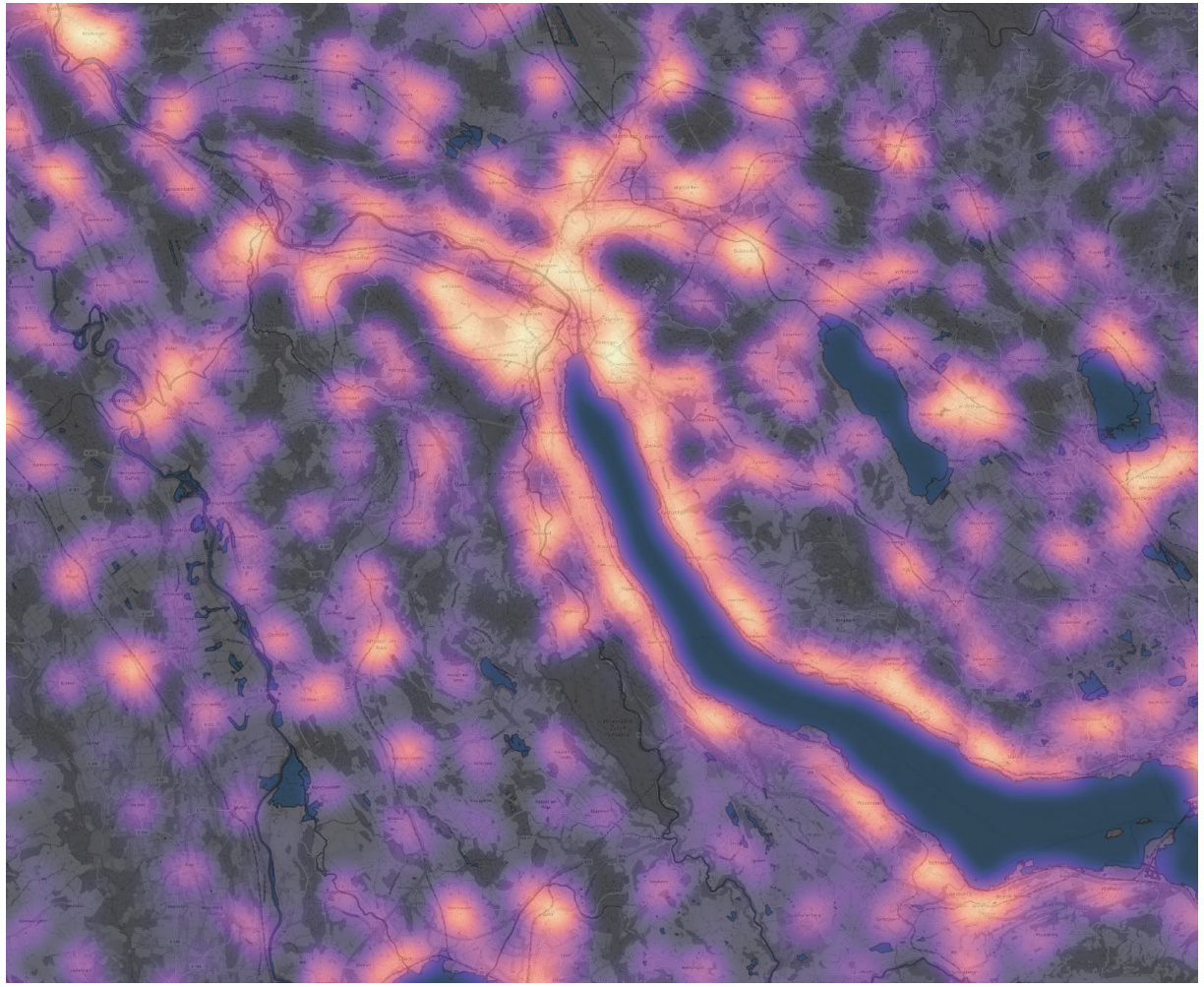
Institute of Sustainable Development
Prof. Dr. Maike Scherrer

Logistics optimisation from the city's perspective, not that of the logistics service providers

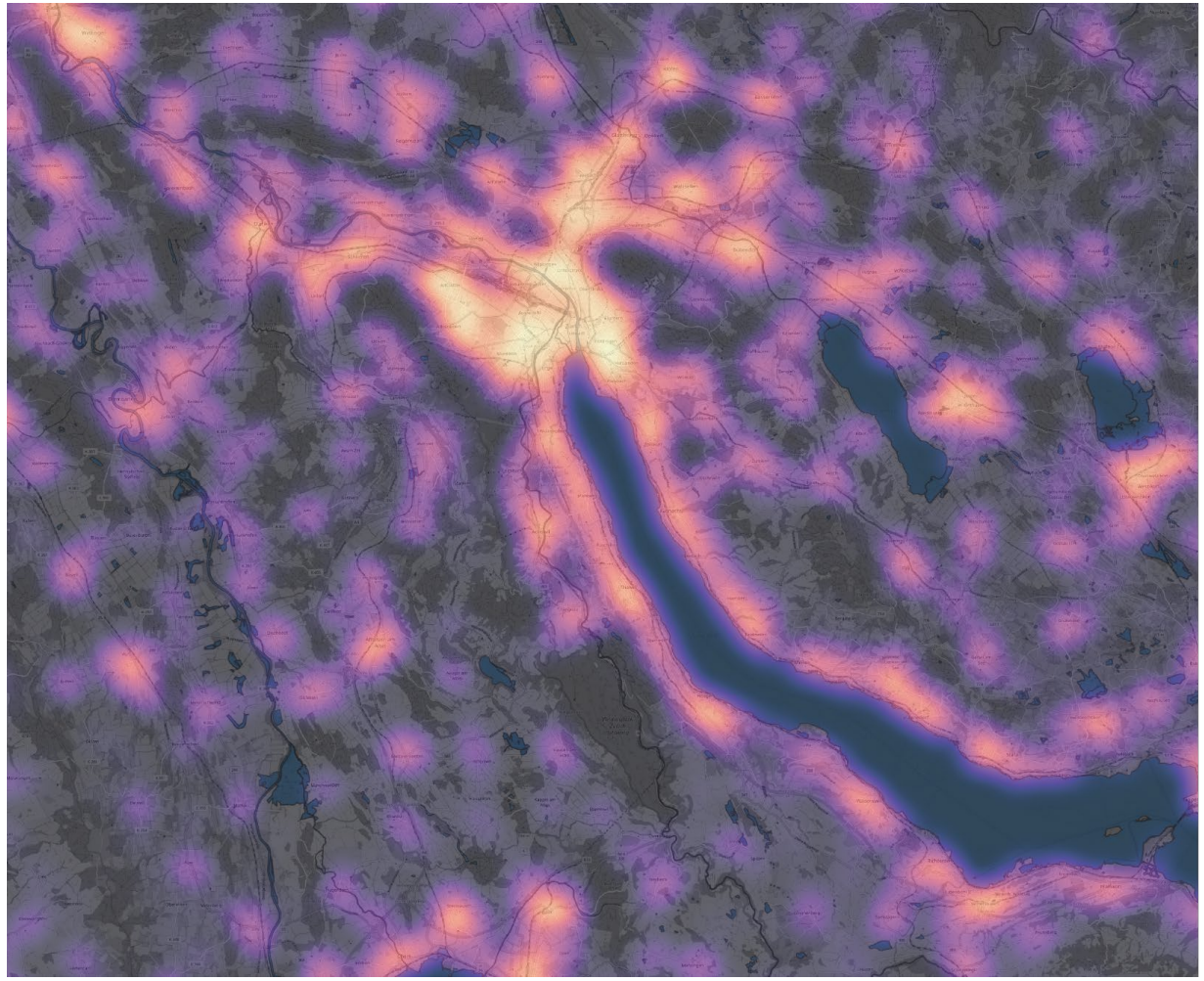


Challenge No 1:
Densification of the urban areas increases

Resident population

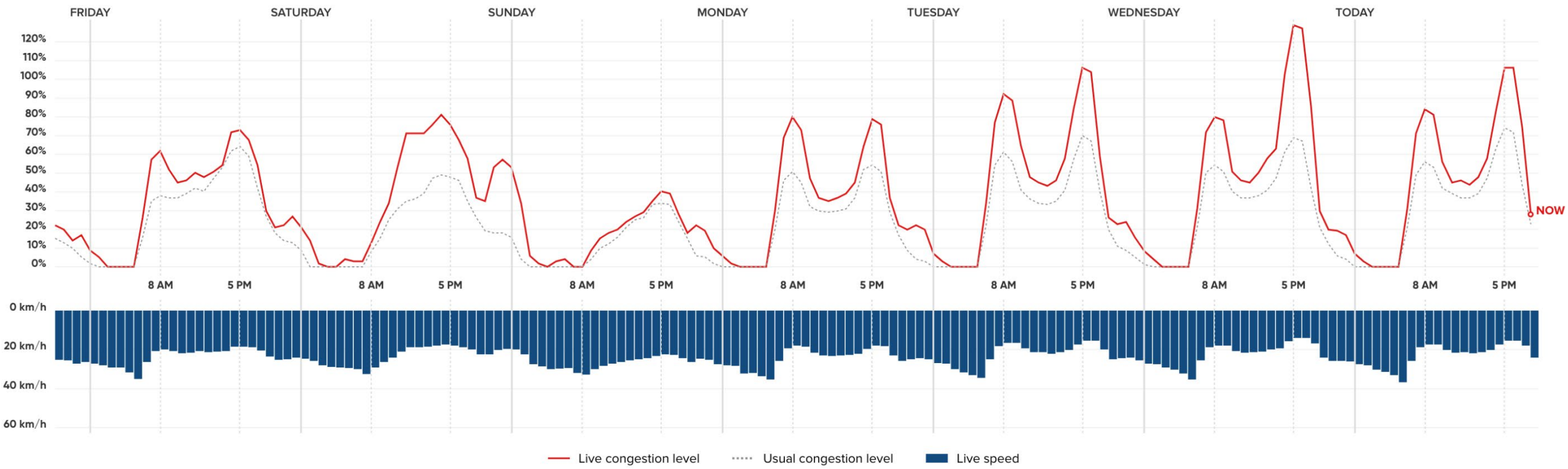


Workplaces



Challenge No 2:
Traffic infrastructure is overloaded

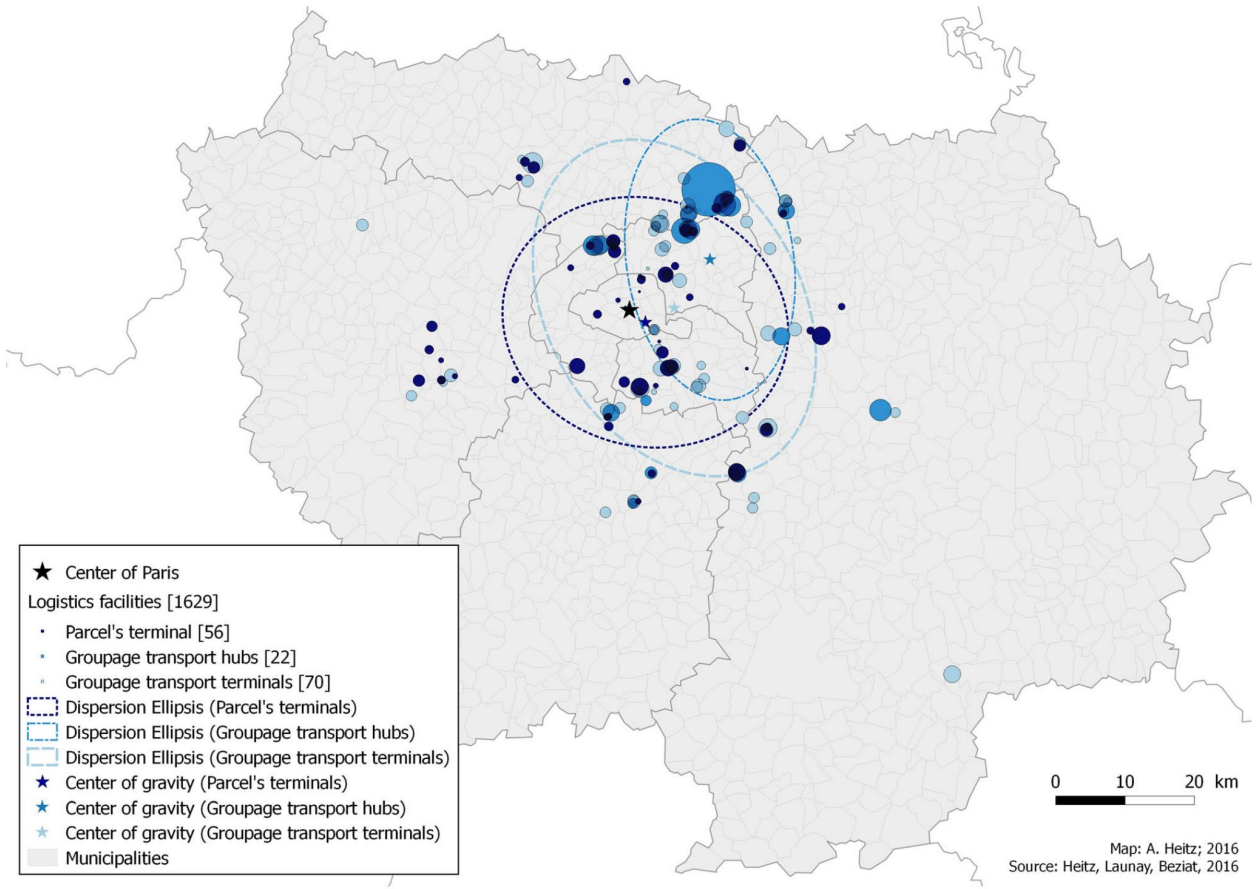
(20.03.-27.03.2025, Stadt Zürich, Zentrum)



Challenge: private and freight transport compete on the same infrastructure, which is difficult to expand

Private transport is accepted, freight transport is not

Challenge No 3:
Freight mobility has been banned from city centres

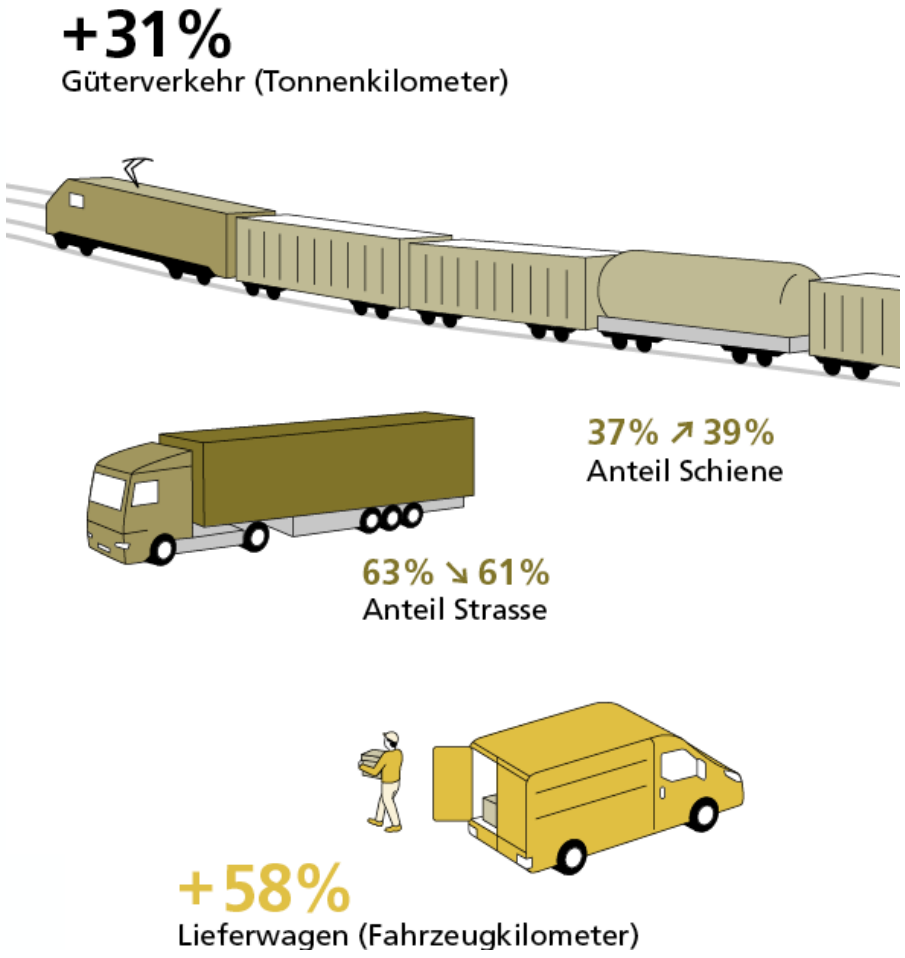


- Activities related to freight mobility pushed out of the city (logistics sprawl)
- Logistics routes have become longer
- Logistics volume has increased significantly
  - Forecasts:
    + 75% -150% parcel volume by 2040
    + 31% expansion of the logistics fleet
    + 58% more small delivery vehicles
- Infrastructure can hardly be expanded

→ Repurposing as a solution

Source: Heitz et al. (2019); ARE (2023)

Challenge No 4:
Logistics drivers are the second most difficult positions to fill



Source: ARE.ch; Astag.ch

Rising demand for logistics services, falling number of available drivers

Situation in Switzerland
- Every year, 5,000 lorry drivers retire
- Every year, 2,000 new lorry drivers start work
- This leaves a shortfall of 3,000 lorry drivers per year

Situation in Germany
- Current driver shortage: 45,000
- Predicted driver shortage by 2027: 185,000

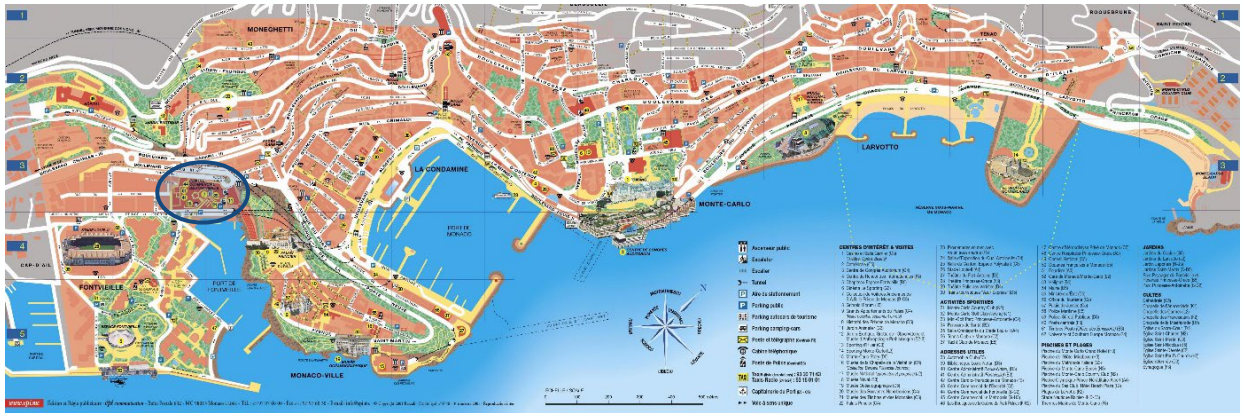
In future, our roads will become congested

- Population continues to grow
- High proportion of silver society
- Urbanisation continues to advance
- Densification in Switzerland continues to increase

- E-commerce is the main form of shopping
- Immediate availability of goods is a must

- Hardly any expansion of road infrastructure possible
- Relative availability of infrastructure for goods mobility declines with population growth and private mobility needs
- Authorities tend to reduce parking spaces and change the use of road space

Solution approach No 1:
Using infrastructure more efficiently



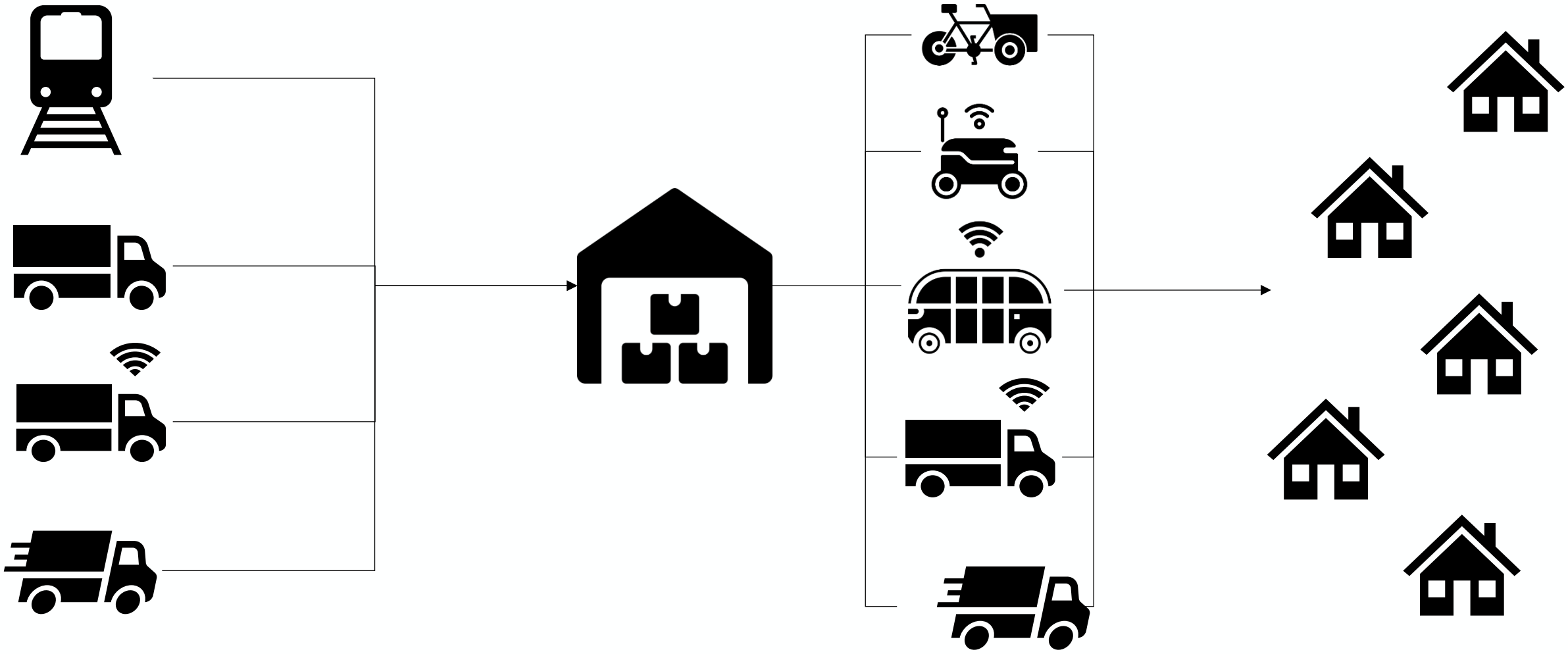
Concept Ecocity, 5km outside Parma (I)

- Partners:
  16 logistics service providers, 17 food producers, 7 food chains, 10 wholesalers,
  Recipients: 250 retailers and restaurants
- Activities:
  Multiple deliveries per day (small retailers 1-3; chains 20-30 times)
  Temperature-controlled logistics and warehousing
- Use of environmentally friendly 3.5-tonne vehicles
  Reduction in CO_2 emissions
- Reduction in kilometres driven in urban areas
  Reduction in CO_2 emissions; less traffic congestion
  Improvement in quality of life and attractiveness of the city

Concept Monaco, Cite centre

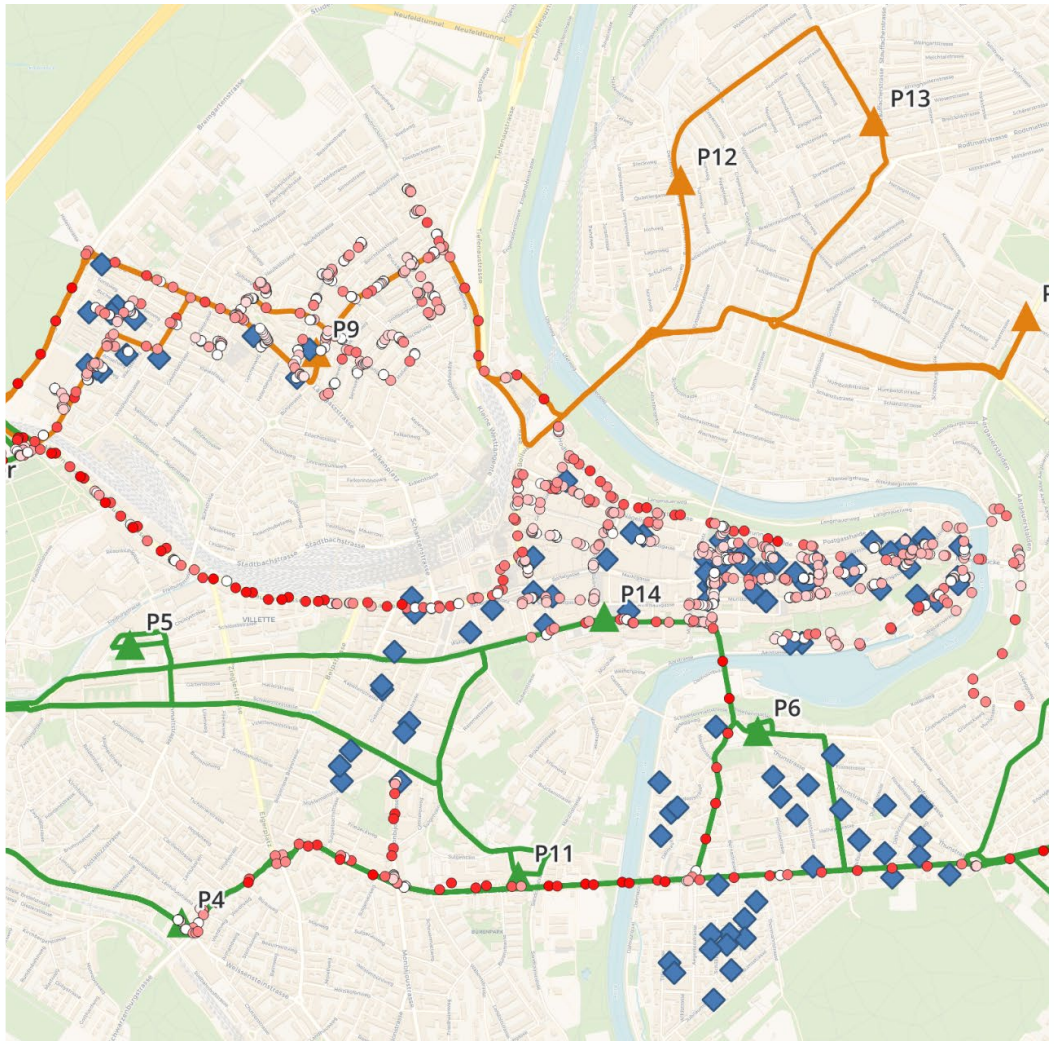
- Urban Consolidation Centre under Fontvieille Shopping Centre
- 1,300 m² of floor space
- Serves 202 hectares and 30,000 residents
- Government has passed a law requiring all suppliers with vehicles > 8.5 t to deliver their products to the UCC
- Storage, order picking and distribution in the city by Monaco Logistique

Solution approach No 2:
Thinking of urban space as a complete system

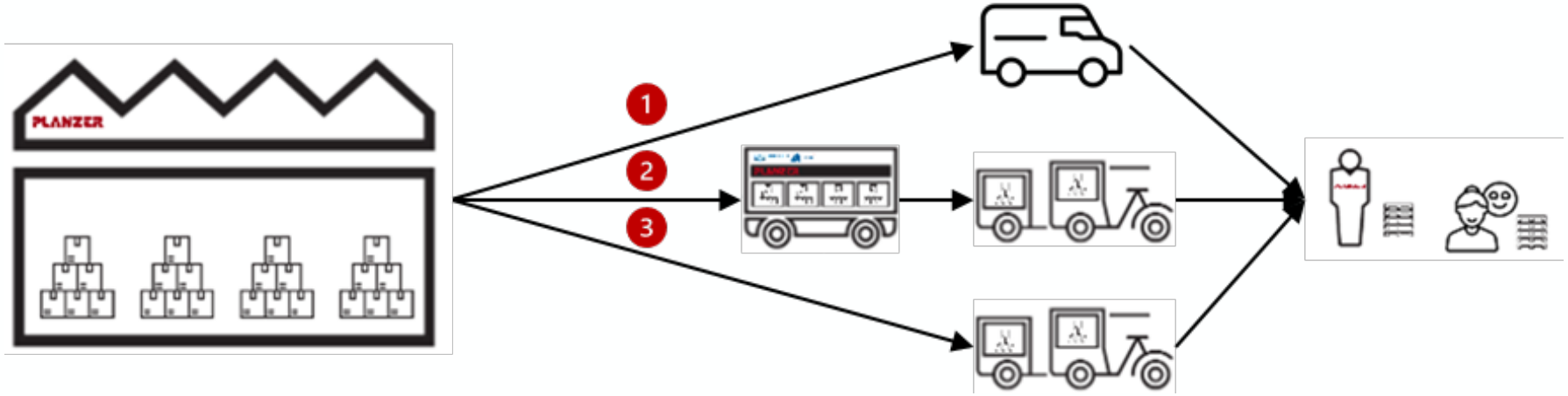


Solution approach No 3:
Shift in demand for road infrastructure

Solution approach No 4:
Multimodal means of transport



Solution approach No 5:
Delivery to urban areas adapted to city areas



Everyone has a role to play in achieving sustainable urban goods supply and waste disposal!

Logistics service provider

Cooperation with competitors and complementary service providers to reduce traffic

Use of hubs and platforms

White/multi-label logistics

Auction platform to offer free capacity

Cities/Politics

Make space available for collaborative partners

Support hubs in urban areas

Push digitisation (e.g., reservable transhipment points)

15-minute cities

Adapt regulations for delivery times/entrances to city centres with alternative technologies/means of transport

Residents

Openness to customer integration in deliveries

Acceptance of logistics services in urban areas

Reasonable expectations regarding delivery speed

Sensitivity/demand for sustainable delivery

Thank you very much for your attention

Prof. Dr. Maike Scherrer

Head of Sustainable Supply Chain Management and Mobility
Institute of Sustainable Development
ZHAW School of Engineering

maike.scherrer@zhaw.ch

+41 58 934 40 43

www.zhaw.ch/ine

PD Dr. Valerio De Martinis

Research Associate, Traffic Engineering
Institute of Data Analysis and Process Design
ZHAW School of Engineering

valerio.demartinis@zhaw.ch

+41 58 934 46 28

www.zhaw.ch/idp