

# Freight Transport Modelling and Sustainability Assessment

## Supporting Urban Freight Decision Making

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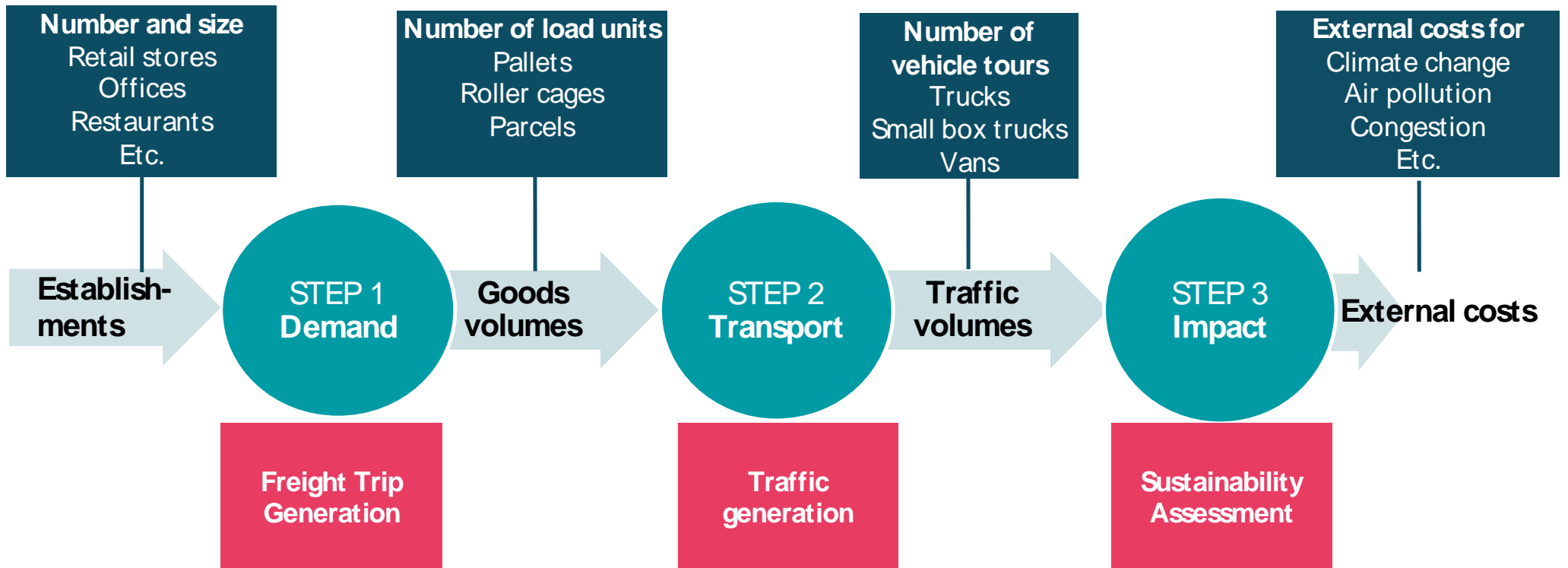
# Urban freight deliveries are a very heterogeneous activity

- Diverse vehicles, goods, load units, actors, receiving environments and urban forms
  - Predicting the sustainability impact of new logistics solutions is crucial for exploring design options, policy, and business decisions
  - Data for total goods and delivery traffic into a city area usually not available
- Need for urban freight data and holistic models for impact assessment

**Research Goal:** to develop an assessment model for estimating the socio-economic benefits of innovative logistics solutions

# Assessment model

# Modelling process – data in/output



# Three case studies

# Three city areas with different size and demand structure

## Gothenburg, inom Vallgraven (2019)

- Central business district
- Mainly retail and offices

## Stockholm, Södermalm (2021)

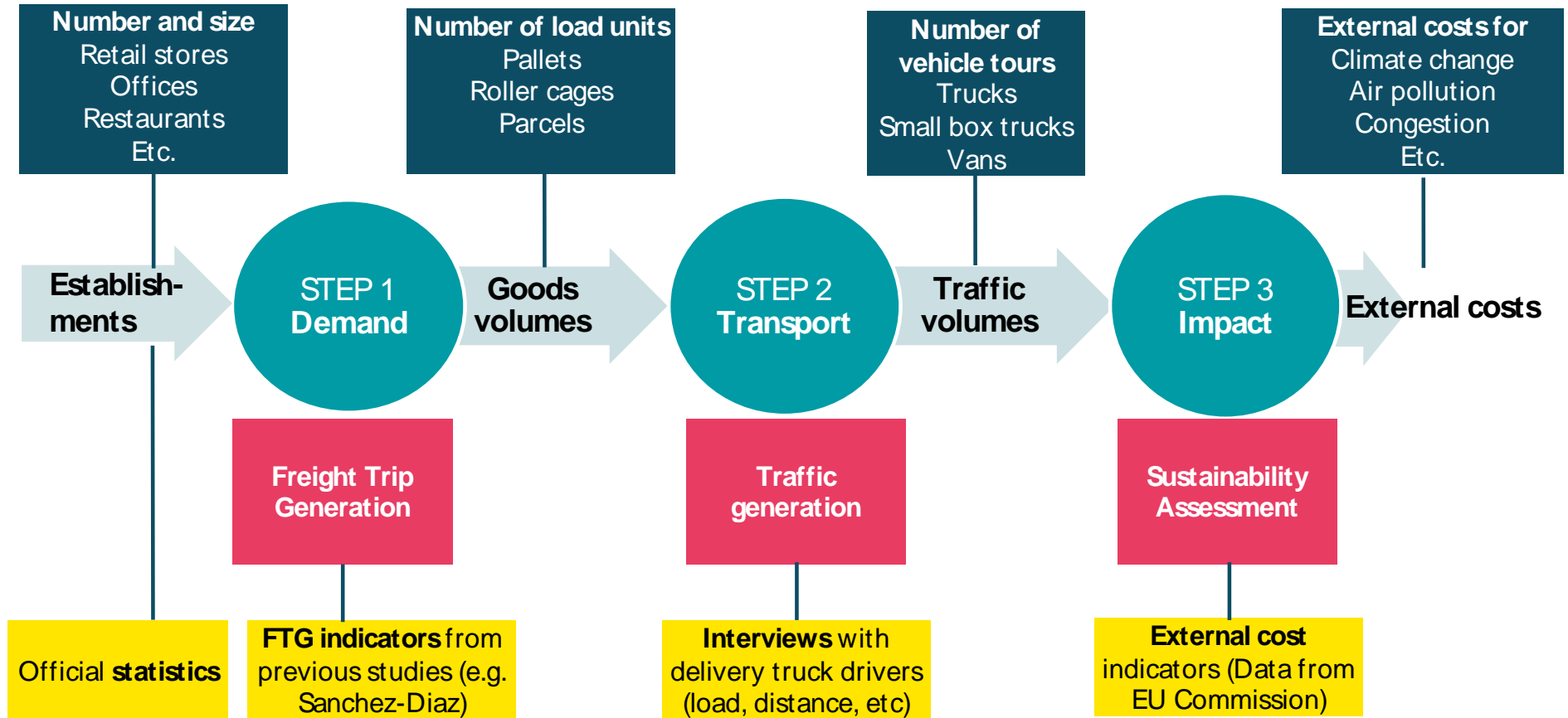
- High-density central city area
- Mixed land-use, incl. residential, offices, shops, restaurants, etc.

## Stockholm, NOHA (2023)

- Central business district
- Mainly retail and offices

	Area	Activity	Residents	Intensity
	km <sup>2</sup>	#Jobs	#individuals	Jobs+Res/km <sup>2</sup>
Gothenburg	0,6	27 000	3 700	49 000
Södermalm	5,7	85 000	92 300	31 000
NoHa	<b>0,2</b>	<b>34 000</b>	<b>400</b>	<b>160 000</b>

# Modell application to NoHa



# Driver interviews at delivery bays

**Observation**  
 Already Answered  
 Date: \_\_\_\_\_ Time: \_\_\_\_\_ Zone: \_\_\_\_\_ Street name: \_\_\_\_\_

**Vehicle**

Reg. number	Truck	SBT	Van	LEPV
Company				

**Cargo, total loaded at start of tour (number of units)**

Parcel	Pallet big	Pallet small	Cage big	Cage small	Other

TOTAL LOADED WEIGHT, (tonne) \_\_\_\_\_

**Tour info**

Start zone	Number of stops	Distance, total km	Duration, hours

Address Terminal \_\_\_\_\_

**Number of planned stops**

Zone	Stops
1. Gamla stan	
2. Norrmalm/City	
3. Kungsholmen	
4. Vasa/Östermalm	
5. Södermalm	
6, 7. Norra/North	
8, 9. Södra/South	

**Notes:**  
 \_\_\_\_\_

Location

Vehicle info



Load info

Route info

Planned deliveries



# Model validation: Traffic count

- Registration of all incoming and outgoing freight vehicles  
06:00 – 21:00
  - manual observation
  - reg. plate recognition cameras
  - pneumatic tube counter
- Fair data output given the high traffic volumes at several stations



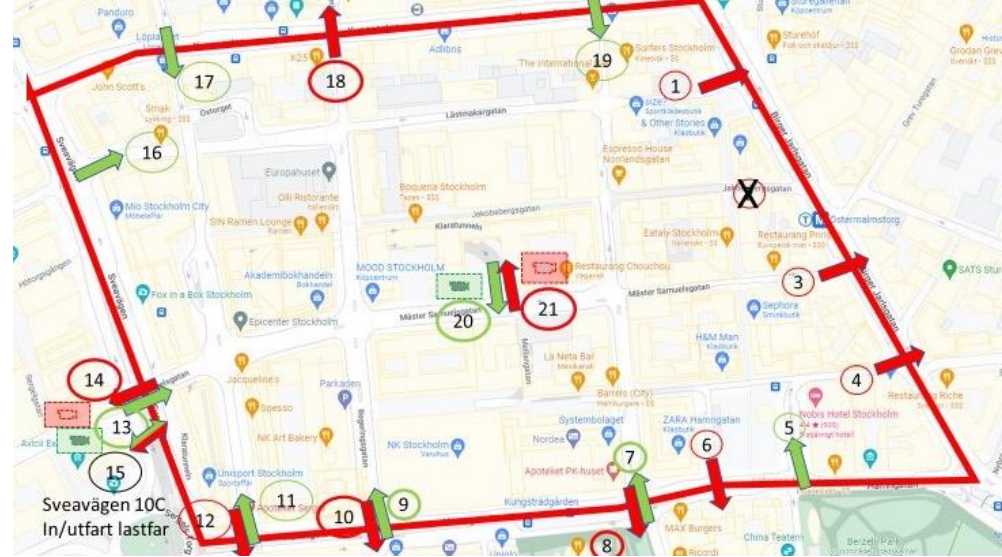
Position	Plate ID	Time	Direction
20	ASWK57	18:23:06	IN
19	ASX93A	15:26:00	IN
21	ASX93A	15:27:56	OUT
17	ASY83F	09:32:00	IN
14	ASY83F	09:39:33	OUT
21	AT4406	21:26:30	OUT
21	ATO39A	15:46:37	OUT

2 minute through traffic

# Model validation: Traffic count NoHa

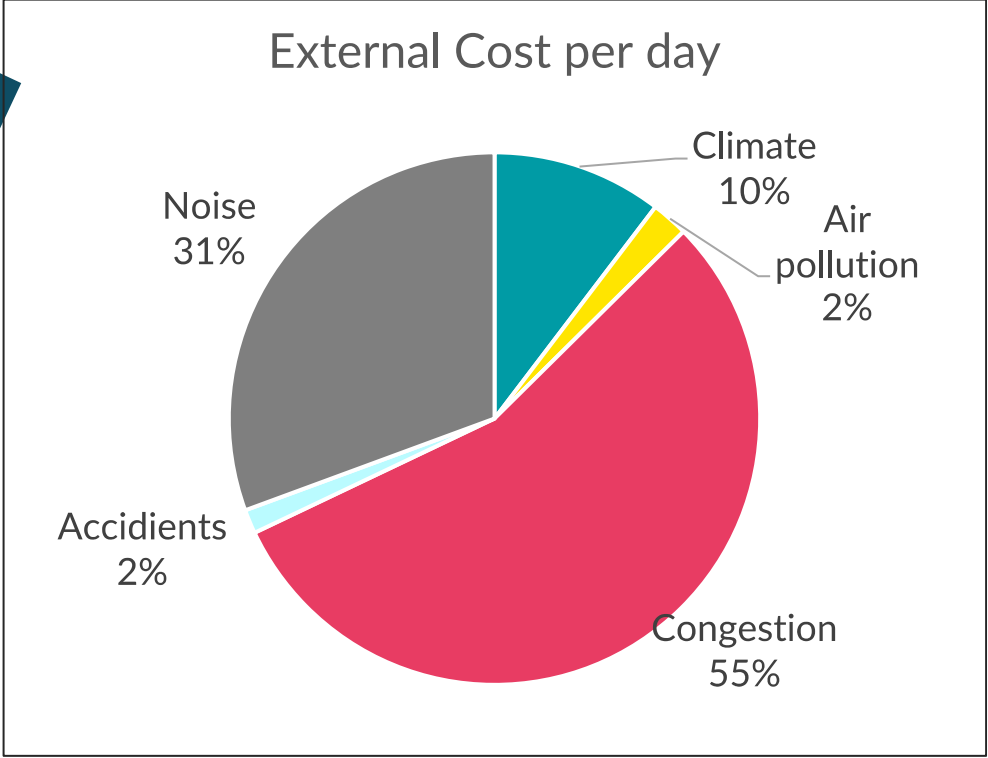
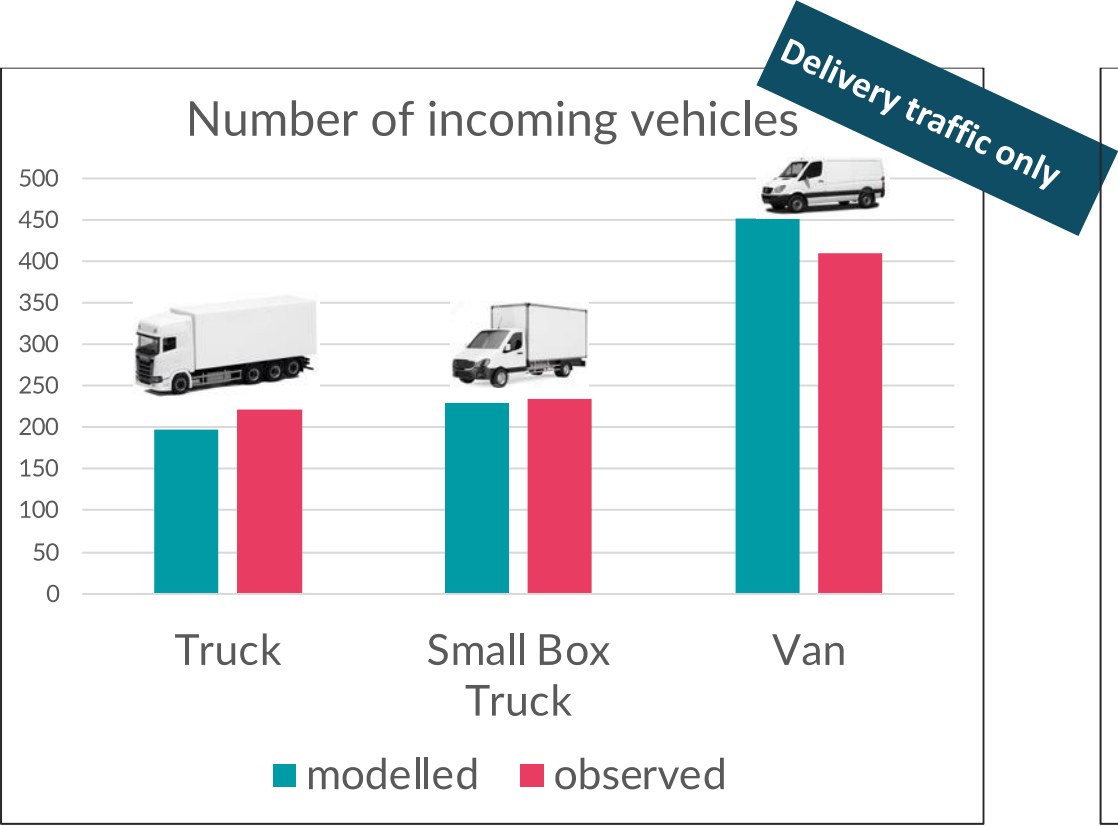


	Truck	SBT	Van	TOTAL
Persontransporter (P)	0	0	0	0
Godstransporter väg (T)	103	92	103	297
Own Account WholeSale and Manufacturing (OA)	59	77	133	268
Hotell Restaurant Catering (HORECA)	0	8	13	21
Service & hantverkare (S)	3	5	36	44
Waste and Recycling (WR)	1	0	0	1
Construction (C)	10	19	117	146
Office och Samhälle (O)	0	0	1	1
Detaljhandel Shops (SH)	0	8	8	16
<b>Godsleveranser</b>	<b>162</b>	<b>176</b>	<b>248</b>	<b>587</b>
Non-delivery	14	32	163	209
<b>Total</b>	<b>177</b>	<b>208</b>	<b>411</b>	<b>795</b>



# Results

# Gothenburg within Vallgraven

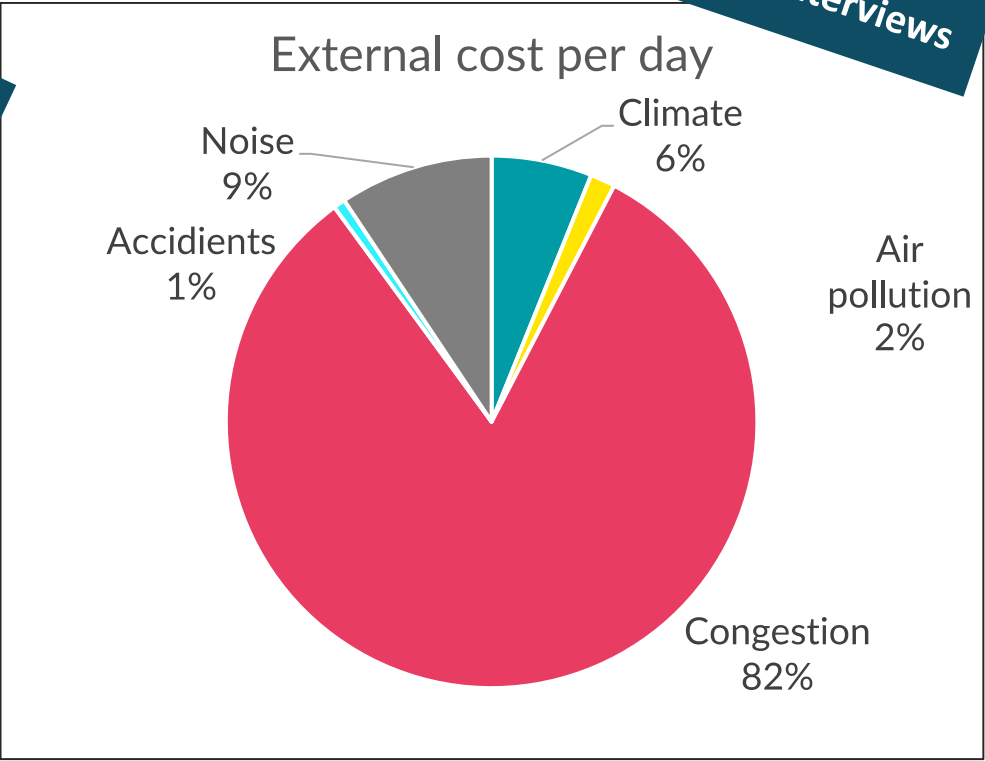
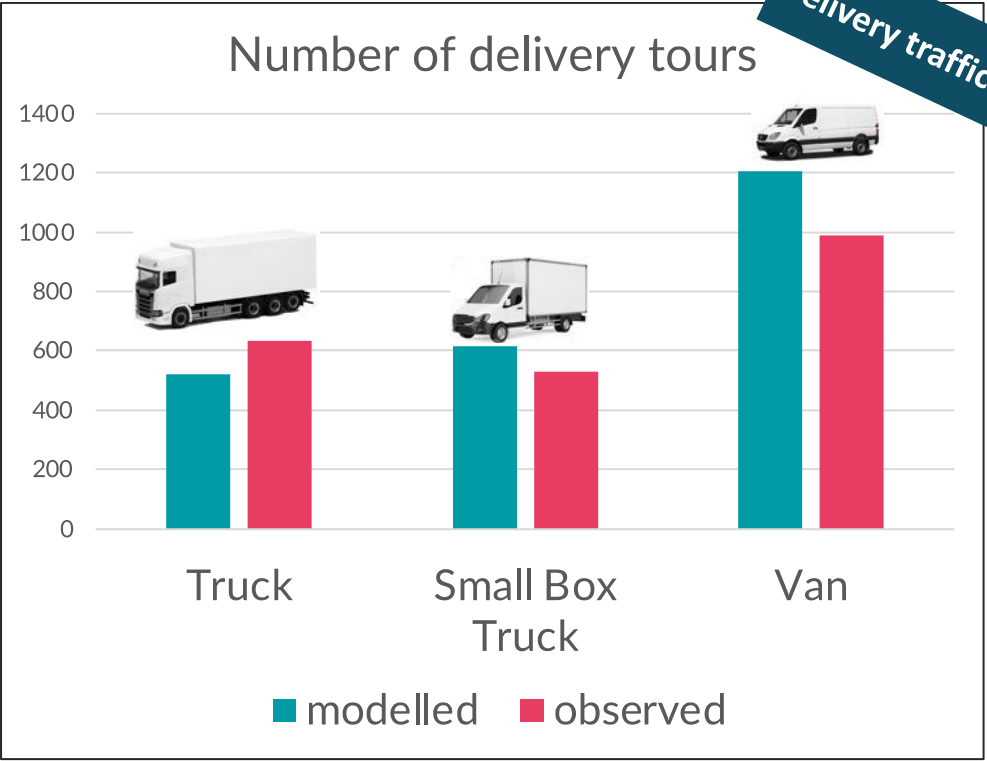


Model deviation from measured traffic: -10% to +10%  
(Total traffic: +1%)

# Stockholm, Södermalm

- Some traffic data loss (Weather)
- Limited driver interviews

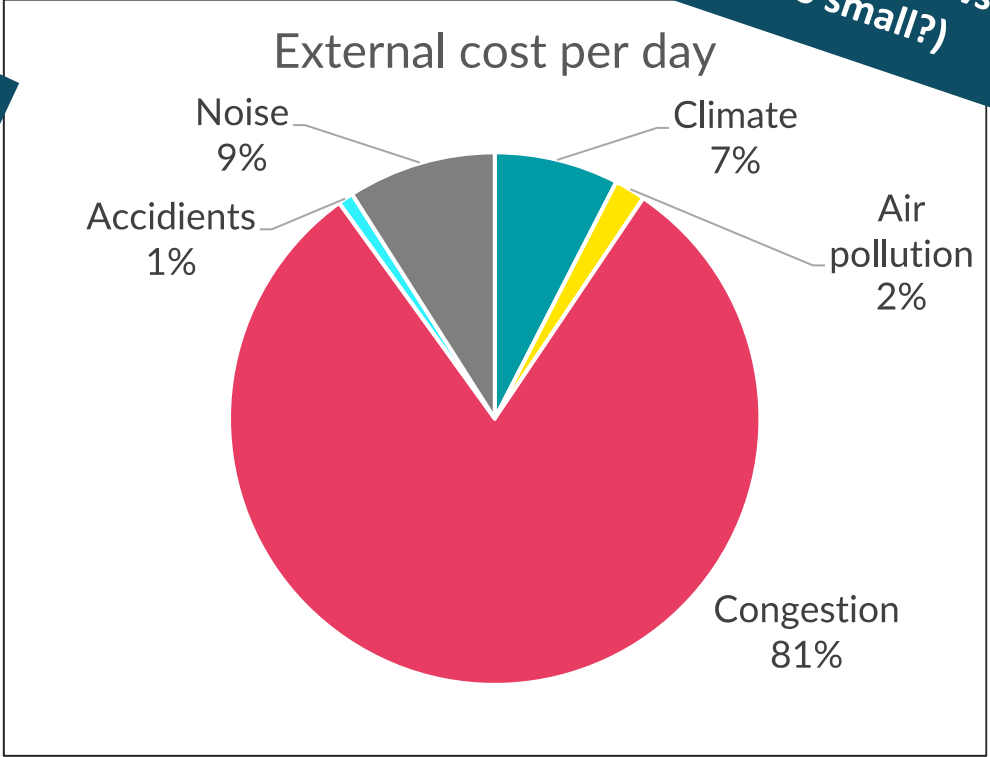
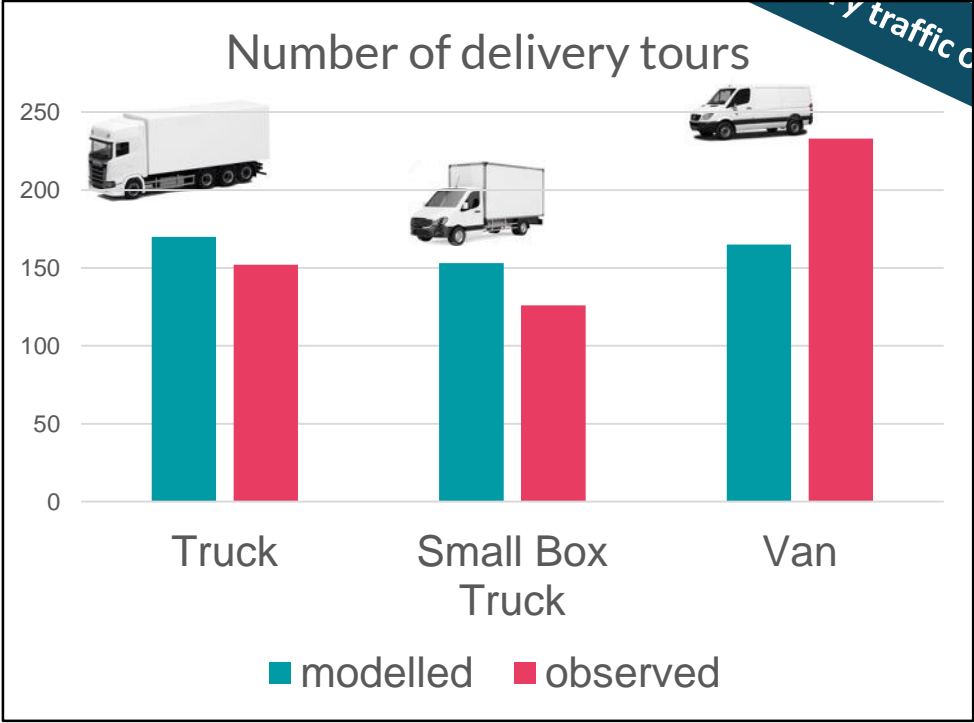
Delivery traffic only



Model deviation from measured traffic: -20% to +20%  
(Total traffic: +10%)

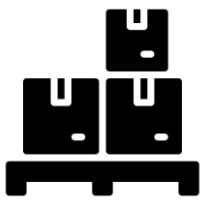
# Stockholm, NOHA

Delivery traffic only



Some traffic data loss (technology)  
• Limited driver interviews  
• (Study area too small?)

Model deviation from measured traffic: -30% to +20%  
(Total traffic: -5%)



# Pallet/roller cages delivery by trucks



SUBURBS

ACCESS ROADS

SÖDERMALM

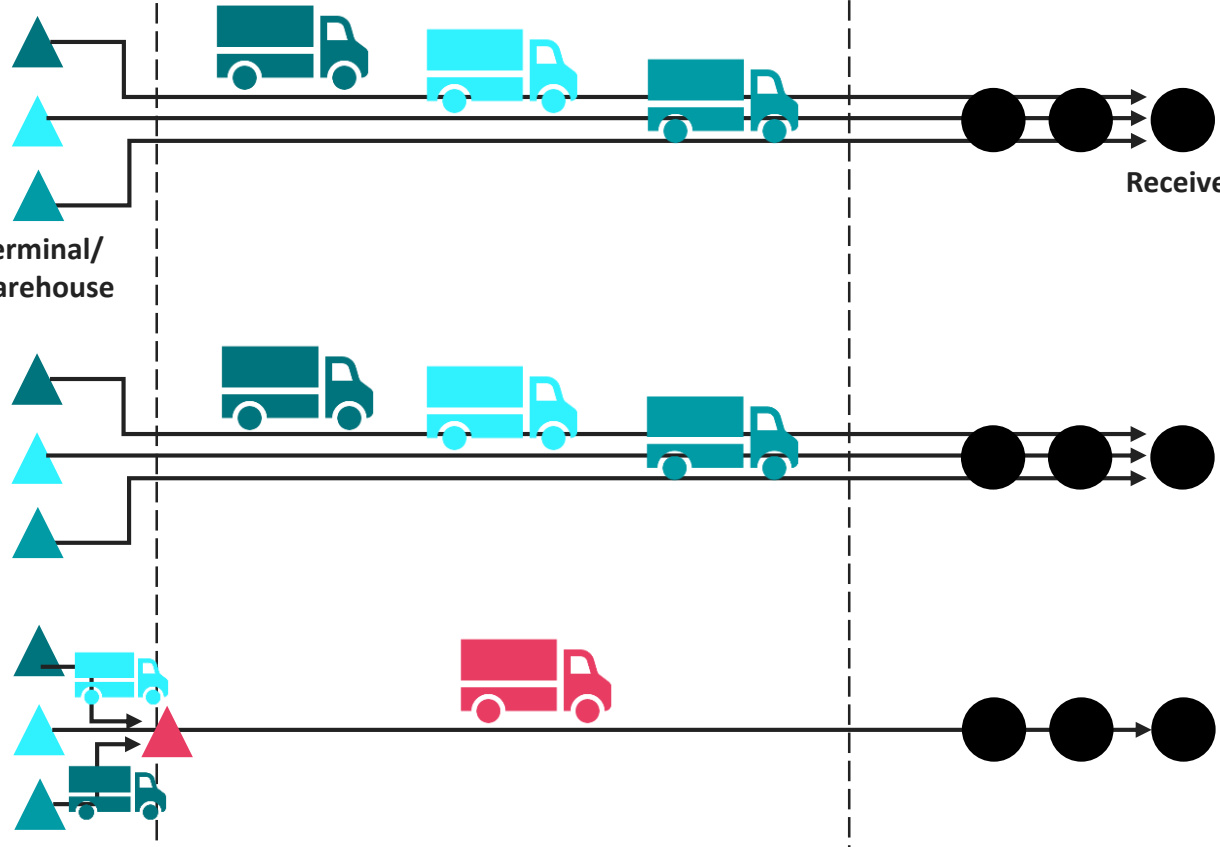
**Business as usual**  
→ Daytime deliveries

Terminal/  
Warehouse

Receivers

**Sc B1: Off-peak deliveries**  
→ no congestion, higher noise unit costs

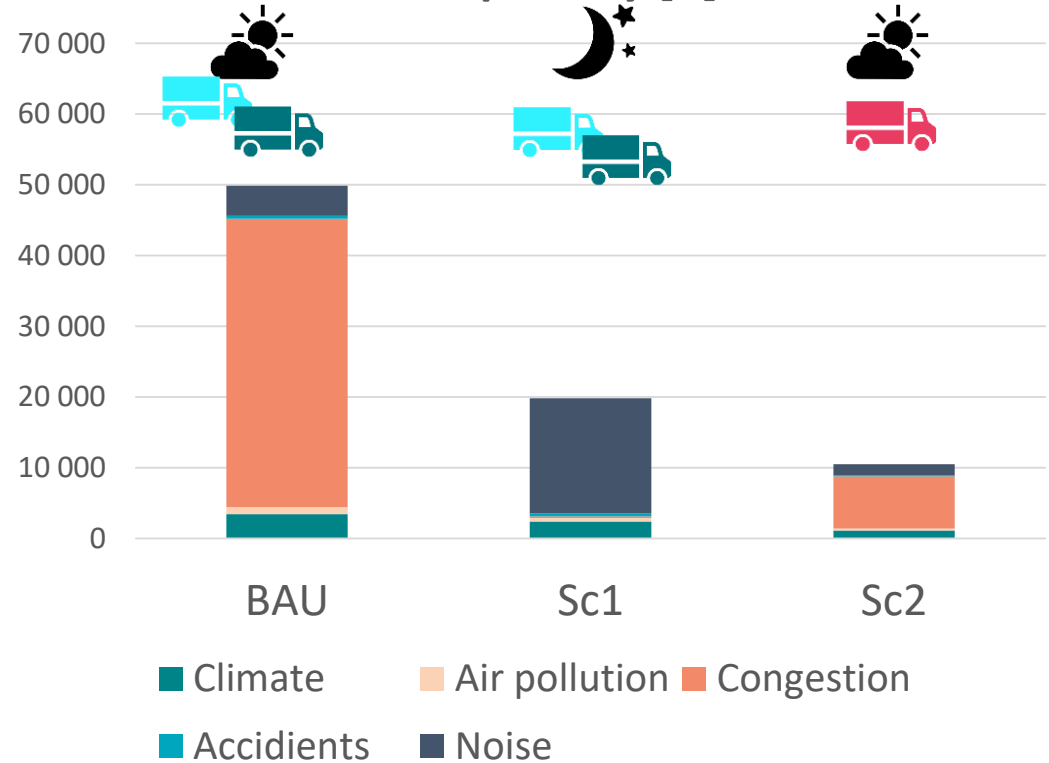
**Sc B2: Suburban consolidation**  
→ Consolidating pallets at hub into larger trucks



# Results: Pallet deliveries

- **Business as usual: Daytime deliveries**
- **Sc B1 Off-peak deliveries:** no congestion, higher noise unit costs
- **Sc B2 Suburban consolidation:** Consolidating pallets at hub into larger trucks

Pallet and cages deliveries: External costs per day [€]





# Conclusions

# Validated assessment model

- Simple model (Excel)
- Estimates the delivery traffic into an area and its socio-economic impact
- Enables analysis of the sustainability potential of logistics measures, e.g.
  - Electrification
  - Consolidation
  - Off-peak deliveries
- Limited data needs



# Experiences from model development & validation

## Good data availability

- Demand estimation (Step 1)
- Impact assessment (Step 3)

## Remaining Challenges

- Route and load data (Step 2, driver interviews)
- Validation (traffic count)
  - Data loss (manual and automatic)
  - Data cleaning (work intensive)

## Relevance of study area design

- Size and type of area (not too small)
- Network context (avoid through-traffic routes in the area)

# Observations from the traffic count

# Observations from traffic count

## Thursday 230608



	Truck	SBT	Van	Total	Share
<b>Incoming traffic, total</b>	<b>402</b>	<b>1 047</b>	<b>3 035</b>	<b>4 484</b>	
<b>Only visit in NoHa</b>	<b>14</b>	<b>32</b>	<b>163</b>	<b>209</b>	<b>5%</b>
<b>Delivery in NoHa</b>	<b>162</b>	<b>176</b>	<b>248</b>	<b>587</b>	<b>13%</b>
<b>Through traffic</b>	<b>225</b>	<b>839</b>	<b>2 624</b>	<b>3 688</b>	<b>82%</b>
<b>Share of incoming OK for env. zone kl. 3</b>	<b>13%</b>	<b>3,5%</b>	<b>9%</b>	<b>8%</b>	

Unique vehicles **NOT** ok for MK3

Truck	SBT	Van
<b>235</b>	<b>560</b>	<b>1900</b>

# Next step

- Apply the model to scenarios developed in WP3 – different options to co-load cargo into the area.
- Finalize scientific article presenting the work

# Thank you!



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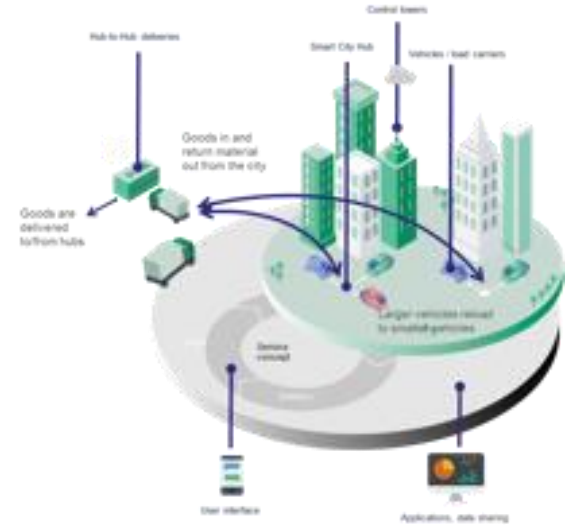
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HITS 2024



**Stockholms  
stad**

**FFI** Fordonsstrategisk  
Forskning och  
Innovation

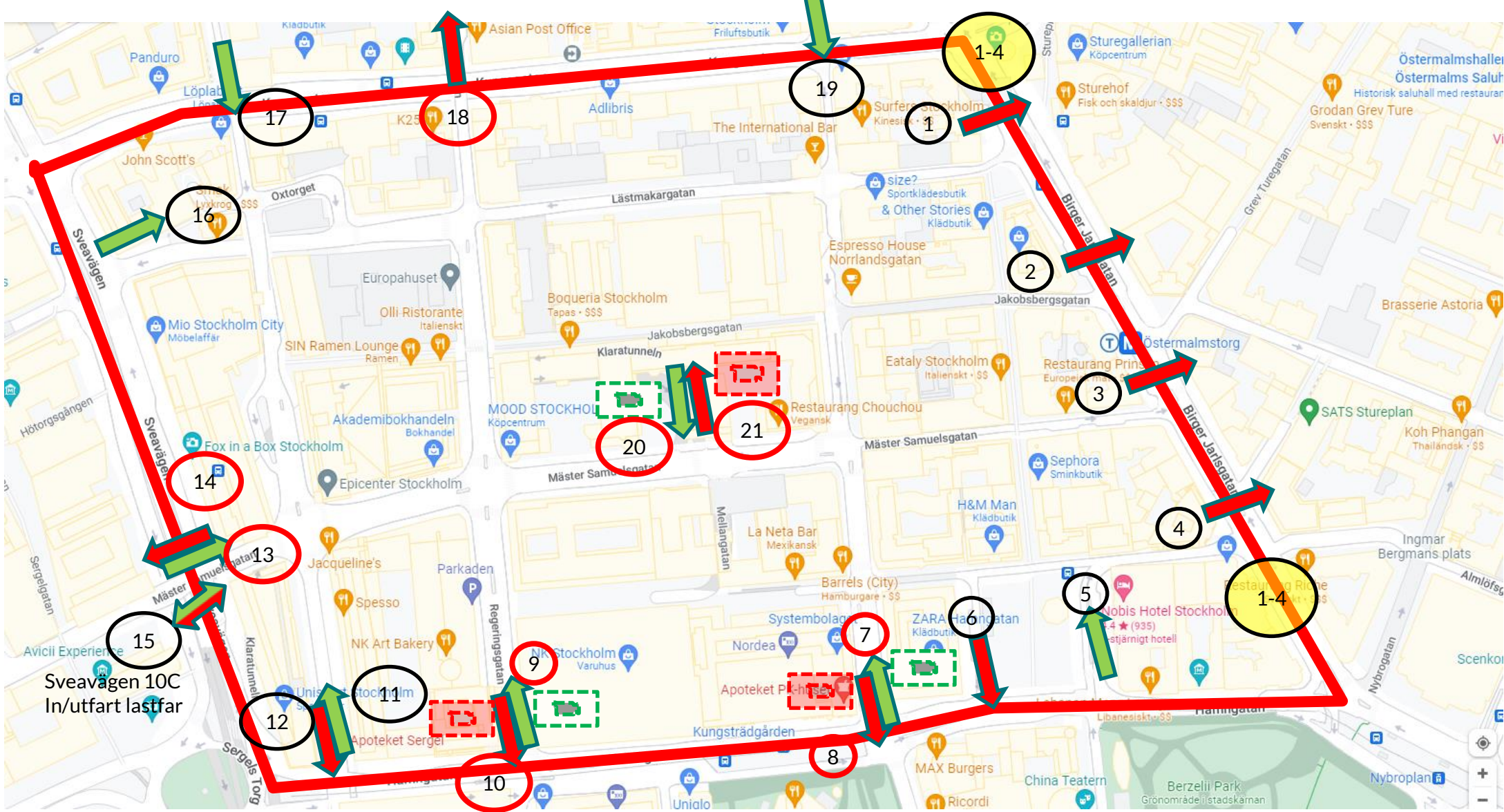


City of  
Gothenburg



# Extra slides

- Map over NoHa
- Simple example of model calculation



Sveavägen 10C  
In/utfart lastfar

17

18

19

1-4

16

1

2

14

20

21

3

13

4

1-4

15

7

5

12

11

9

8

10

1-4



# Modelling process – Example

