

# Freight distribution in cities: Design challenges

A lunch lecture in course AR3CS100

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# Purpose of the lecture

- To (as far as needed) introduce you into the topic of city logistics
- To help you understand that its challenges are (partially) also your challenges
- To stimulate you to think differently about the city logistics
- To stimulate you to think about or even develop (new) solutions to improve its functioning
- Such solutions should (in my opinion) be part of integrated city (re-)design and *not* an 'afterthought'
- Such solutions may improve our world a bit

# Logistics

Logistics: Efficient organisation of the transport of goods from producer / supplier to the (final) customer

Also called the *logistic or supply chain*

Both producer / supplier and (final) customer may be located in different countries and even in different parts of the world - then we speak of a *global* supply chain

# About logistics - high volume transports



**Container terminal**  
[roadstars.mercedesbenz.com](http://roadstars.mercedesbenz.com)



**Freight distribution centre (DC)**  
[europe-re.com](http://europe-re.com)



**On the road**  
[automotivelogisticsmedia.com](http://automotivelogisticsmedia.com)



**From big to smaller (regional or urban DC)**  
[roadstars.mercedesbenz.com](http://roadstars.mercedesbenz.com)

# City logistics

Many organisations and individuals responsible for part of a chain

City logistics - the final ('last') kms / miles of a logistic chain

You are part of that chain if

- \* You receive or send packages as a consumer
- \* Buy goods in a (n online) shop or other business
- \* Have or work in a business receiving or sending packages



# Consumer demand for goods in cities

Demand for goods is quite complex:

- Volume - **number of consumers**
- Demand per consumer - volume, split into goods categories e.g., food, non-food
  
- **Buying behaviour**
  - > Type of store: physical ('brick & mortar'), webshop (ecommerce)
  - > Buying quantities
  - > Buying moment
- Etc.
  
- Buying **experience** - order fulfillment (do you get what you ordered, on-time)

# Are cities popular?

Cities are popular, in particular among age 30-

Outflow: age 30+, but also age 30-

On balance: Net outflow - **number of consumers is not rising**

"Natural" process - suburbanization-reurbanization etc.  
City population is dynamic - age distribution changes

"Hip" versus age-dependent motives for migration: Cost of living, liveability

PBL, Trek van en naar de stad, Veranderingen in verhuispatronen, 1996-2018, 2019.

# Changes in consumer buying behaviour

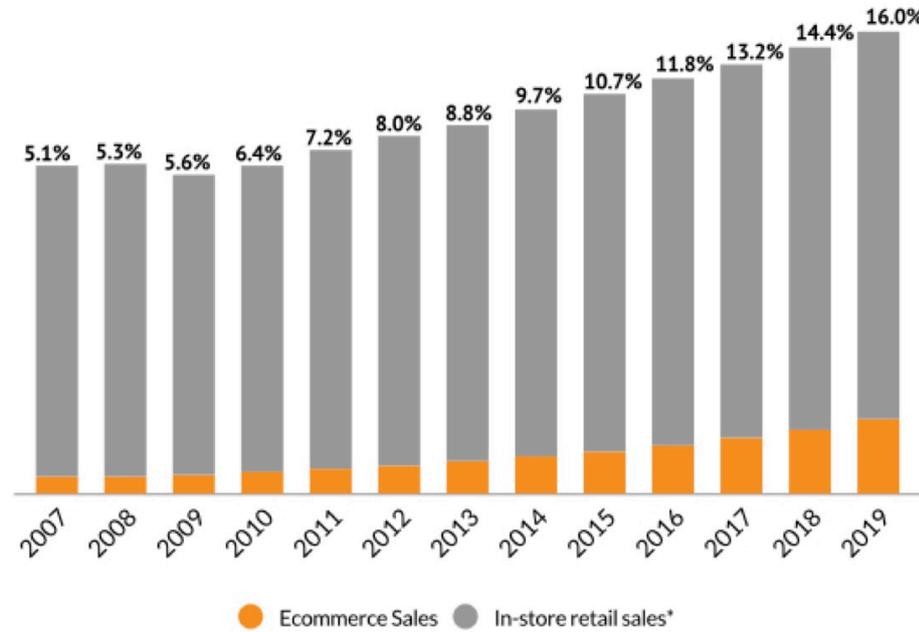
Internet - rise of e-commerce

Adapted and new types of goods and services



### U.S. e-commerce penetration

U.S. e-commerce sales as a % of total retail sales



Ali, F., A decade in review: Ecommerce sales vs. retail sales 2007-2019,

<https://www.digitalcommerce360.com/article/e-commerce-sales-retail-sales-ten-year-review/>.

# Logistic system changes

Response to rise of e-commerce

Adaptation by brick & mortar stores

Rise in multichannel logistics

- Traditional shops go online
- Ecommerce goes 'brick & mortar e.g. Bol.com, Amazon open (or take-over) physical shops

# Urban impact is rising

Rise of ecommerce means

- Rise in home delivery and pickup ('last mile')
- More kms driven, more vehicles on the road, parking needs
- > Already huge pre-covid

Expected to keep growing post-covid:

- Experience and adaptation
- Convenient, affordable (to many) etc.

# Demands on urban logistics are rising

Logistic (order fulfillment) challenges:

- Consumers demand fast delivery (next day -> same day?)
- Less planned transports (compared to business deliveries)
- Limited trip coordination among logistic companies

Many return trips:

- Not at home
- Non-fulfillment e.g., clothes do not fit

Environmental impact rises. Example world's 100 top cities:

78% growth in demand for last mile delivery

36% more delivery vehicles in innercities

Parking needs rise

21% more traffic congestion (11 additional car minutes per daily commute)

30% more CO<sub>2</sub>-emissions in 2030 (25 million ton) without effective intervention

## There has never been a time of greater demand for last-mile transport



### Urbanization

**60%**

people living in cities in 2030

**20–35%**

congestion increase since 2010



### Customers

**2.1bn**

people expected to buy goods online by 2021

**20%**

online retail share by 2023



### Products

**10%**

per annum e-grocery growth worldwide

**32%**

of furniture sold online by 2023 in the US



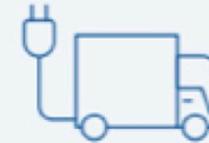
### Delivery

**20%–40%**

growth in same-day

**10%**

per annum growth in instant delivery



### Technology

**14–35%**

xEV share of new car sales across regions by 2030

**2024**

year in which most OEMs will release L4/5 autonomous vehicles

**78%**

growth through 2030 in urban last-mile deliveries

Hillyer, M., Urban deliveries expected to add 11 minutes to daily commute and increase carbon emissions by 30% until 2030 without effective intervention, <https://www.weforum.org/press/2020/01/urban-deliveries-expected-to-add-11-minutes-to-daily-commute-and-increase-carbon-emissions-by-30-until-2030-without-effective-intervention-e3141b32fa>.

# Actual negative local impact

Depends on many factors

- Urban fabric (street network layout, building density)
- Type of area - innercity, suburban
- Overall traffic volume (congestion)
- Freight traffic volume
- Vehicle technology used
- Etc.

# Policy: Accessibility and environment

Traditional approach:

- Restrictions on traffic (vehicle routing, vehicle size and weight, time windows (e.g. before opening times of shops))
- Car free areas (pedestrian zones)
- Obligated use of urban distribution centers (UDC's)

Did not solve the problem: Congestion and pollution remained, organisation problems, higher logistics costs etc.



# Policy: Accessibility and environment

Recent (innovative) approaches:

- Pollution and noise regulation
- Flexible time windows, night delivery
- New technologies

# New vehicle technologies and logistic concepts

## New vehicle technologies

- Lower emission vehicles (euro 6+, hybrid diesel-electric)
- Zero emission vehicles (electric, hydrogen)
- Autonomous vehicles

## New logistic concepts

- Cooperation between transport companies
- Scale reduction: Smaller, but still motorized
- Smaller, non-motorized e.g. bike couriers
- Parcel lockers
- Off-road: Water (barges), air (drones)



[newsroom.hermesworld.com](http://newsroom.hermesworld.com)

# *Designing* for urban freight transport?

Design requirements:

- High volumes
- Oversized and overweight products
- Organisation: Cooperation between competitors?
- IT improvements: Flexible ordering, receiving (time windows for home delivery)
- Transport is a very low profit business (if at all)
- Privacy - is your data safe?
- Security of delivery
- **Urban (re)design**

# Urban (re)design

## Traditional:

- Logistics as a nuisance
- Re-active public policies - afterthought

## Innovative:

- Forward thinking public policies - Integrate logistics into urban planning
- Small-scale pilots - area (re)development

# Conclusions

Logistics is a vital economic activity

Treating it as a nuisance does not make sense

It seems better to find ways to better integrate it into our daily lives

The challenge is yours!

Thank you. Questions?



# Contact



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