Sustainable city logistics: recent research from the Logistics City Chair

Dr. Laetitia Dablanc
• Warehouses, innovations, new trends in consumption and impacts on city logistics

Results available online:
• Observatory of ecommerce mobilities
• Logistics real estate and relationships with urban form in 74 large cities around the world

Outline

• General trends in city logistics
• Environmental emissions and methodological issues: data!
• Warehousing and impacts
• Clean vehicles and low/zero emission zones
Since Covid, city logistics closely scrutinized.
Pandemic impact on e-commerce

- **Visibility** of last mile issues (politicians, media, anyone)
- **Volumes**: France 2020: +32% B2C products sold (growth rate twice as high as usual) however France 2021: +7%
- **Omni-channel**: traditional retail has changed into omni-channel commerce
- **Curb**: increased number of deliveries and use of curb

Beijin April 2020

Paris Dec 2021

NYC March 2022

Arte

H. Buldeo Rai

M. Schorung
Convergence: similar changes and innovations worldwide

- Consumer and societal **demands** increasing
- Innovative supply of logistics **services**, converging processes: DHL, Ifood, Prologis... catering for all metropolitan areas
- Start-ups, **urban freight tech** everywhere, often with food tech
- Local **policies** remain quite different?
Presentations and Panel Discussions Include:

- Algorithms and Analytics
- Delivery Drones
- Delivery Robots
- Autonomous Cars
- Autonomous Delivery Vehicle (ADV)
- Autonomous Ground Vehicles (AGVs)
- Autonomous Pods
- Robotics
- Droid
- Robot Delivery Technologies
- Van/Drone/Robot Integrated System
- System of Systems
- Smart Door Lock
- Trunk Delivery
- Parcel Box
- Parcel Locker
- Mobile lockers
- Required Support Structure
- Warehouse Locations
- Unmanned Warehouses
- Platooning
- Tracking Technologies
- Low-Density Cities
- High-Density Cities
- Medium-Density Cities
- Same-day, Instant Delivery or Sunday delivery

- Same-Day delivery
- On-demand delivery
- Drones, Remote locations
- Self-Driving cars, Remote locations
- Robots, Gated communities and closed campuses
- Storing packages for buyers to pick up
- Maximizing Delivery
- Not-at-Home & Failed Deliveries
- Gated Communities, Residential Buildings and Office Buildings
- Hospital Campuses, Corporate Campuses, and Universities
Quick-commerce for grocery

- Cajoo promises to deliver in 15 minutes
- Gorillas promises to deliver in 10 minutes
- Alibaba promises to deliver in 5 minutes

- "Dark stores": use of vacant stores or underground parking facilities
- In China, with longer experience of q-commerce: 5% market share of all online grocery shopping
Dark stores in Paris

- 80 to 100 by January 2022 (APUR)
- Half of them could be closed by the municipality (March 2022)

**Enseigne**
- Cajoo
- Flink
- Frichti
- Getir
- Gopuff / Godja
- Gorillas
- Yango Deli
- Zapp
Dark stores from Getir, Gorillas, Glovo in Europe as of March 2022
Diversification of vehicles for urban deliveries

- Trucks and vans in French cities: 75% of last-mile drivers
- Cars, mopeds, cargo-bikes, bicycles, walking/transit: 25% of last-mile drivers already (much less in volume of deliveries)
- Amazon Flex in US cities
- Labor issues and labor legislation
Many delivery workers on foot, the return of portering

Dablanc, Schorung, March 2022
Every day from a 20,000 sq m last mile delivery station:
- 45 lorries
- 250 vans
- 795 private cars

(Jaller, 2019)
Today’s trend: a reduction in logistics facilities’ land footprint

• 2021 Amazon fulfillment center in Delaware, US
• 350,000 sq m of operations on 70,000 sq m land area
On-demand ‘instant deliveries’

- Deliveries in less than two hours, smartphones and apps
- Gig workers, self-contractors
- Labor laws, legal complexities
- European Commission Directive project, Dec 2021

Lagos  Lima  Mumbai
Giant companies, a moving market

- Meituan market valuation in May 2022: $120 bn
- Frichti sold to Gorillas in March 2022
- Postmates sold to Uber for $2.65 bn in 2021
- JustEatTakeaway may sell GrubHub after just one year acquisition
- Deliveroo IPO in March 2021
Reduction in use of bicycles in Paris (2016-2022)
Restrictions to the use of bike-sharing (2022)

<table>
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<th>2016</th>
<th>2020</th>
<th>2022</th>
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<tr>
<td></td>
<td>87%</td>
<td>60%</td>
<td>47%</td>
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Surveys City Logistics Chair

- “Any use for freight transport is forbidden”
- “Forbidden to do more than 300 km per week”
- “Forbidden to do more than 70 trips per week”
Autonomous deliveries emerging in specific markets

JD deploys 100 autonomous delivery vehicles to aid Shanghai residents under lockdown

Nuro in Texas

Starship in the UK

Flytrex in Iceland and the US
Paris region, freight share of transportation related emissions

<table>
<thead>
<tr>
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<th>Total region</th>
<th>Paris</th>
<th>Dense suburbs</th>
<th>Far suburbs</th>
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<tr>
<td>CO₂</td>
<td>19%</td>
<td>34%</td>
<td>18%</td>
<td>7%</td>
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<tr>
<td>PM10</td>
<td>30%</td>
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<tr>
<td>NOₓ</td>
<td>29%</td>
<td>51%</td>
<td>26%</td>
<td>9%</td>
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</tbody>
</table>

(B2B only) (% of total transport emissions) Coulombel, Dablanc, Koning, 2018
E-commerce mobilities: poorly quantified

- *New York Times* March 4, 2021 “Roughly 2.4 million packages are delivered in the city every day, nearly half a million more than before the pandemic, and city data shows that 80 percent of deliveries are to residential customers, compared with 40 percent before the outbreak”
  
  = **0.23 parcel per day per person**

- *Le Monde* January 21, 2021: “According to head of Colissimo, there were one billion B2C parcels delivered in France in 2020”
  
  = **0.04 parcel per day per person (six times less)**
E-commerce carbon assessment

Figure 1. Carbon footprint of online and store purchases (p < .001).

- Meta-analysis of case studies around the world (Buldeo Rai, Touami, Dablanc, submitted 2022)
CO\textsubscript{2} emission sources, Ecommerce v commerce in store (MIT Real Estate Lab, 2021)

A huge share of packaging
Carbon footprint of freight for city of Paris (2020, with 2018 data)

- **Global CO₂ emissions from freight in 2018 (including imports by Parisians): 5 Mt (21% of all carbon footprint of Paris)**
- **Local CO₂ emissions from freight in 2018: 1.2 Mt**
Comparing 2004-2014

- CO₂ emissions from urban freight “decreased by 18% between 2004 and 2014”
- Vans underestimated
- Motorized two-wheelers not included
Barcelona: data from areaDUM

- Since 2015 all delivery drivers must register on AreaDUM app when stopping for delivery
- 30 minute window allowed
- Provides live data to municipality as well as *open access* data to research

- Delivery Area ID
- Plate Number
- User ID
- Vehicle Type
- Activity Type
- District ID
- Neighborhood ID
- Coordinate, Weekday, Date, Time
ANPR camera data

- Cameras in 40 Dutch cities soon (zero emission zones by 2025)
  - Data available but restricted by GDPR since 2019, processed by a trusted third party
  - Type, Euro standard, brand, size of vehicles
  - No data for foreign vehicles
  - No information on when where vehicles get out
  - Security cameras not included in data access

- Source: interview with TNO and HAN univ, June 2021, on-going study by Logistics City Chair

- “It is really a pity to not be able to use data that is actually there” (City of Gothenburg, March 2021)
Zero emission city logistics roadmap, Rotterdam: an opportunity for data sharing
Exploratory automated data collection (Oliveira, Schorung, Dablanc, 2022)

- *Points of interest* from OpenStreetMap to identify urban vs suburban areas
- Warehouse rental prices from real estate market sites
Exploratory use of OpenStreetMap to map warehouses in detail (Schorung, 2022)
Warehouses: disruption of transport ‘logic’
Consolidating, going as close as possible to final destination saves vehicle-km

-51% CO₂ emissions

Jontion and Dablanc, 2017

Agence Nanterre

Hub de Chilly-Mazarin

Agence Beaugrenelle

Hub de Chilly-Mazarin
New urban warehouses are based on goods flow consolidation ... and use of trucks

Tokyo

Brooklyn

Paris
Wealthy areas served by warehouses located elsewhere: example of Issy/Boulogne in the Paris metro area
Innovation in urban warehouses

• A dynamic (niche) market
• Innovative architecture on former industrial areas
• Multi-levels (vertical warehouses, underground warehouses)
• Temporary and flexible contracts
• Mixed-use

=> Innovative, useful and... expensive and very regulated
Hubs in underground municipal car parks

Under the Louvre, Paris

Under Plaza Mayor, Madrid (FM Logistic Ibérica)
Urban logistics hub under Paris ring-road
Chapelle logistics hotel (45,000 sq m)

- Recycling of a former freight rail area
- Four levels
- Multi-use: logistics, offices, data center, sports, urban farm
- Rail infrastructure (unused yet)
Foncier: 1 ha de toiture
Programme: env. 6 200 m² DEVE et 3 800 m² DJS
Permis de construire à déposer
A very discreet Amazon warehouse in Brooklyn/Red Hook

• Amazon Flex delivery workers
• Street parking and difficult handling of cart

Dablanc, March 2022
New urban formats and architecture for warehouses from mainstream developers

Prologis, project ‘Size’ Paris 17th

Segro, project ‘Centre Paris 19’, Paris 19th
‘Neighborhood uproar against the future logistics facility”
Le Parisien, Sept 2021
Electric vans: large and small companies

• According to sources:
  - TCO is OK after 4 or 5 years
  - TCO remains +10%
• 4% new vans are electric in March 2022 (AVERE)
• Commitment from large companies, support to small last mile providers
Sustained interest for cargo-bikes in Europe

Main advantage: access to bike lanes

International Cargo Bike Festival October 2022
Docks are returned to promenade after transloading
UPS trial of waterway transport of trailers between Brooklyn to New Jersey

April 2022
Zero emission trucks are still too expensive

Lorries represent a third of deliveries in French cities
Methane, bio-methane or battery electric?

Biden officials are trying to stop the Postal Service from spending $11.3 billion on gas-powered trucks, citing pollution and climate change
Amazon: CNG and electric

Order of 1,064 CNG trucks for European market in 2021
Many regional operations by large lorries could fit electric batteries.
Low and zero emission zones in Europe

- France is 9th among 15th countries for efficiency of low emission zones for city logistics
- Ranking by Belliard, Dablanc, 2021
London Low Emission Zone

- All the metropolitan area
- Lorries and large vans
- Euro VI for lorries
- *Ultra Low Emission Zone* in a large central area (Euro 6) (for all veh including vans but not lorries)
- Three *Zero Emission Zones* by 2025
- Automated plate reading cameras (ANPR cameras)
Low Emission Zone in Grand Paris: progress

2017

2022
Ressources

- METROFREIGHT
  www.metrans.org/metrofreight
- Urban Freight Lab: https://depts.washington.edu/sctlctr/urban-freight-lab-0
- Urban freight platform:
  https://www.chalmers.se/en/centres/lead/urbanfreightplatform/Pages/default.aspx