Training

Urban Freight Transport: Challenges and Solutions

Dr.-Ing. Wulf-Holger Arndt | German Institute for Urban Affairs
Part I – Interview round: Introduction to training

- Who’s who?
- What are the backgrounds of the participants and what is their relation to UFT?
- What are the expectations of this training?
- What is the goal of this training and what do we want to achieve?
- What will be done in this training?

Who is who?
Agenda and time table

- Part I – Interview round: Introduction to training
- Part II – Presentation: Definition and trends of urban freight transport and understanding urban problems in freight transport
  
  **Break**
  - Part III – Presentation: Solution for urban freight transport
  - Part IV – Champion City presentation
  - Selection of main solutions in UFT and preparation of working groups
  
  **Break**
  - Part V – Working groups – case studies
  - Part VI – Results of working groups and wrap-up & outcomes
Part II – Definition and trends of urban freight transport and understanding urban problems in freight transport

• Commercial transport: Any movements of goods and persons for business and commercial purposes

<table>
<thead>
<tr>
<th>Transport</th>
<th>Immaterial transport</th>
<th>Material Transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>Telephone, fax, data transmission</td>
<td>Passenger transport</td>
<td>Goods transport</td>
</tr>
<tr>
<td>Private passenger transport</td>
<td>Commercial transport</td>
<td>Private goods transport</td>
</tr>
<tr>
<td>Commuter, shopping, leisure transport,...</td>
<td>Passenger commercial transport</td>
<td>Service transport</td>
</tr>
<tr>
<td>UFT = Urban Freight Transport</td>
<td>UFT</td>
<td>Goods commercial transport</td>
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<td>CT = Commercial Transport</td>
<td>CL = City Logistics</td>
<td>HDV = Heavy Duty Vehicles</td>
</tr>
</tbody>
</table>
Volume of urban commercial transport

Trends with increasing commercial transport:
- Changed spatial demand
- New timely requirements on transport demand
- Increasing complexity for logistic services

Ø 1/3 of all transport in cities (tkm) [KiD 2010]

- Main share of freight transport on roads
- Road transport has high amount of impacts

Delivered goods for distances covered – \( T = T(\text{dist})^2 \)
Example Italy 2010
Source: Marinov 2013
Some backgrounds and trends in UFT in detail… and environmental impacts

UFT = Urban Freight Transport
CT = Commercial Transport
CL = City Logistics
CEP = Courier, Express, Package services
New production concepts

- New design of supply chain
- Reducing of in-house production depth (outsourcing)
- Production segmentation (assembly manufacturing)
- Introduction of Just-in-Time-philosophy
- Single, modular sourcing, (reduction component supplier and forwarder)
- ECR (efficient consumer response)

![Cascade model car seat production diagram](image)
E-Commerce

Def.: ICT support of business processes, e-procurement and online trade

Online trade

Fast growth: ~1/5 of all retail trade in non-food segment (HDE-Online-Monitor 2016)

Variations increasing: mixed distribution
  • Online ordering → then take away shops
  • Show rooms → then online ordering
  • Classical shopping

Mixing of supplies as in newspaper shops with parcel services etc.

Future: Multifunction shops with all distribution channels

Share of online trade in diff. trade cat. in Germany

- Online trade in Bil. Euro (without FMCG)
- Share of online trade of the whole online&offline market (without FMCG)

Old prognosis 2016 for Germany: 20% already!

Increase of delivery based on online trade

Delivery situation before online trade increased

Delivery situation since increased online trade

Increasing number of delivery services
- More CEP\(^1\) companies
- Cargo bike couriers
- Private take away/on-demand delivery (Postmates, Uber freight,…)
- ….

More and faster deliveries
- Amazon Prime Now 2h

Increasing CEP\(^1\) market (red line) → more traffic

CEP market and the transport sectors in Germany

\(^1\) Courier, express, package services
Consequence: Increase of empty trips at the whole mileage

- Example for Germany: share of empty km at the total mileage

![Graph showing the share of empty km at the total mileage over different mileage ranges from 2008 to 2012.](image)
CO₂ emission inner urban

**CO₂ emissions inner urban**

- Light Duty vehicles
- Duty vehicles <= 12t
- Heavy duty vehicles > 12t

**Driving performance inner urban**

- Light duty vehicles
- Duty vehicles <= 12t
- Heavy duty vehicles > 12t

**CO₂-Emissionen innerorts**

- Cars: Pkw (inkl. Zweiräder) 84,5%
- Commercial vehicles: Busses 2,5%, Sonstige 1,5%
- NFZ 11,5%
- LNFZ 1,2%
- Solo-Lkw <= 12t 2,0%
- Solo-Lkw > 12t 3,0%
- Last-/Sattelzüge 5,3%

**Fahrleistung innerorts**

- Pkw (inkl. Zweiräder) 88,9%
- Busses 0,5%
- NFZ 9,9%
- LNFZ 6,8%
- Solo-Lkw <= 12t 1,2%
- Solo-Lkw > 12t 0,8%
- Last-/Sattelzüge 1,1%

Daten für 2014, Quelle: TREMOD 5.61 (09/2015)
Carbon emission and traffic

- Strong growth of traffic-related carbon emissions
- Super proportional growth in freight transport

GHG emissions per sector and targets

Traffic-related GHG emission

Specific CO₂ emissions in freight transport in g/tkm

EU target 2050

Other sectors

2010

2050

OECD 2015

EU target 2030

OECD 2015

LKW 92,5 g/tkm

ship

Binnenschiff 33,0 g/tkm

Eisenbahn 21,9 g/tkm

rail

Quelle: neu 2010
Nitrogen oxide emission inner urban traffic

Source: Martyn Douglas 2016; Data for 2014, TREMOD 5.61 (09/2015)
Particles & Diesel Exhaust
inner urban traffic

Particle and diesel exhaust emission inner urban traffic

- Light duty vehicles
  - Duty vehicles <= 12t
  - Heavy duty vehicles > 12t
- Trucks

Driving performance inner urban

- Light duty vehicles
- Duty vehicles <= 12t
- Heavy duty vehicles > 12t
- Trucks

Source: Martyn Douglas 2016; Data for 2014, TREMOD 5.61 (09/2015)
Particles & Diesel Exhaust

- Fine dust, diesel exhaust
- Carcinogenic
- Lorries often have diesel engines
- Increasing problem

Passenger car and lorry shares of PM10 emissions of a main street in Berlin

Only light-duty commercial vehicle inner urban:
- Share **NOx emission** (Nitrogen Oxide): 8%
- Share **particle emission** (PM10): 28%

Source: TREMOD 5.53; Values of 2003
## Noise emission

### Noticed noise disturbance
(Share „at least something troubles“)

<table>
<thead>
<tr>
<th>Noise sources</th>
<th>share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Street traffic</td>
<td>54%</td>
</tr>
<tr>
<td>Neighbours</td>
<td>40%</td>
</tr>
<tr>
<td>Industry and commercial</td>
<td>21%</td>
</tr>
<tr>
<td>Air traffic</td>
<td>21%</td>
</tr>
<tr>
<td>Rail road</td>
<td>17%</td>
</tr>
</tbody>
</table>

Source: BMUB/UBA: Umweltbewusstsein in Deutschland 2014

### Noise cat.

<table>
<thead>
<tr>
<th>Kind of sound</th>
<th>Volume</th>
<th>sound perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tick of a soft clock, fine rain, whispering</td>
<td>30 dB(A)</td>
<td>Very soft</td>
</tr>
<tr>
<td>Fridge humming, quiet residential street</td>
<td>40 dB(A)</td>
<td>Slightly soft</td>
</tr>
<tr>
<td>Soft radio music, usual daily noise level</td>
<td>50 dB(A)</td>
<td>Normal</td>
</tr>
<tr>
<td>Conversation in 1 m distance, office noise</td>
<td>60 dB(A)</td>
<td>Normal to loud</td>
</tr>
<tr>
<td>Loud conversation, shouting, car at 10 m distance, lawnmower</td>
<td>70 dB(A)</td>
<td>Loud to very loud</td>
</tr>
<tr>
<td>Traffic noise at heavy traffic, max. speaking volume</td>
<td>80 dB(A)</td>
<td>Very loud</td>
</tr>
<tr>
<td>Factory hall, truck noise at 5 m distance</td>
<td>90 dB(A)</td>
<td>Very loud</td>
</tr>
<tr>
<td>Road noise in 7 m distance, chainsaw, brass band</td>
<td>100 dB(A)</td>
<td>Very loud to unbearable</td>
</tr>
<tr>
<td>Nightclub noise, rock concert, drill</td>
<td>110 dB(A)</td>
<td>Very loud to unbearable</td>
</tr>
<tr>
<td>Aircraft engine</td>
<td>120 dB(A)</td>
<td>Unbearable</td>
</tr>
<tr>
<td>Jet fighters, MP3-player</td>
<td>130 dB(A)</td>
<td>Pain threshold</td>
</tr>
</tbody>
</table>

### Noise sources share

- Street traffic: 54%
- Neighbours: 40%
- Industry and commercial: 21%
- Air traffic: 21%
- Rail road: 17%
Infrastructure costs = forgotten costs!

Modernity Change Infrastructure in Germany 1980 to 2007

Investment demand for German municipality road bridges 2013-2020: 1 bill. € per year!

Arndt 2013
http://www.difu.de/projekte/2012/ersatzneubau-kommunale-bruecken.html

Abrasion of roads

1 LKW (24 t) = 10,000 PKW (1.4 t)

Source: ProgTrans AG, Basel 2009, from: Ralf Pagenkopf, GF Straßen.NRW (Pres. at BPPP, July 2013)
Problems caused by urban commercial traffic

- Pollutant emissions
- Noise pollution
- Accident endangerment
- Infrastructure damage
- Impairments / barriers for the traffic flow
- High spatial use and separation effects
- Impairment of the townscape
- Road as economic surface:
  - Road as storage facility
  - Logistics nodes on the road
  - Dump road
    - (36% of the supply and pick up operation in the public street space)

solution e-vehicles?
Problems for the commercial transport

- Delivery problems by design of road side
- Public transport stops
- Parking lanes
- No loading and unloading possibilities for delivery vehicles
- Stops in second row
- Stops on the crossing, junction or traffic light areas as well as on sidewalks
- Structural restrictions in the street space
- Barriers by building sites in the road space
- High traffic volume during new building projects
- Logistics in the road space
- Conflicts with other road users
- ...
- ... many topics, many tasks...
Main UFT problems in your city?

• Each participant should write 3…4 problems on cards
• Trainer will cluster these on a pin wall
• In a discussion at the end of part IV we will select the 3 most important problems in UFT as topics for the 3 working groups

Examples of UFT problems:
• Delivery problems of last mile and the impact of urban areas
• Emission problems (pollution and noise) of fossil driving UFT vehicles
• Loading problems as stopping in second driving lanes and loading zone misuse

→ UFT problems pin wall
Part III – Solution for urban freight transport
Planning process, stakeholders

- Consider specific stakeholders and policy fields in UFT

- Integration in all steps of planning process is needed
- Integration in all plans and planning levels are needed: national, regional, local; informal (land-use plans, transport plans), and formal (detail plans, …)
Actions fields of municipalities to reduce traffic in delivery

- Promotion of **low emission delivery vehicles and concepts**, e.g. restricted areas as environmental zones
- Implementation or support of coordinated **route navigation** e.g. using ITS systems to optimise the delivery tours
- Installation of **loading zones** for delivery vehicles, commercial transport is essential for a city
- Support of **receiver cooperation**, e.g. platform (delivery ramp) sharing, common procurement
- Support of **supplier cooperation** (City-logistics 2.0)
- Initiating **consulting platforms** for commercial transport problems
- Implementation of **area concessions** for delivery
- Usually **low cost** solutions!

Electric vehicles

- Reduction in CO$_2$: e.g. -11 up to -13 % at German power production mix now

**Advantages of electric vehicles in the urban CT:**
- Long life vehicle performance
- Small daily vehicle performance in CT
- Stop and Go traffic
- Regular trips
- Fewer prone to break down
- Low operating cost

Grafik: Aischinger 2015

Share of the vehicle classes of the daily total vehicle performance in the German CT (KiD 2010)

Quartiles of the daily road performances in the WIV after industries (Arndt, 2016)
Electric vehicles

- Electric vehicles = no local emissions, low noise
- Adapted electro delivery vans for serving in pedestrian zones, residential areas, narrow streets …
- But consider the cost for companies in the case they have to renew their whole fleets
- Low offer of heavy duty e-vehicle!
- Examples without subsidies in practice
  - Gnewt Cargo, London
  - Cargohopper, Amsterdam
  - BSS, Nijmegen
  - UPS, Hamburg
Modal shift

Shift from ... to ...
Lorries/Cars
Rail
Bikes
Walk

www.cyclelogistics.eu:
~50% of urban goods transport could be delivered by bike
• The use of cargo bikes is mostly a cost efficient solution
Micro consolidation – last mile logistic

- Micro consolidation centres in both directions: collecting and delivering
- Bundled transport to the transhipment points by lorry
- Delivering and collecting in the area by cargo bike
  - Projects in many European cities, e.g. Bentobox Berlin, SMILE Hamburg, City2Share München
  - A win win situation = cost neutral
  - There may be costs for the ground

Example: Mobile depot by TNT Express in Brussels

http://www.bentobox-berlin.de/citylog-projekt/
Loading zone

- Commercial transport has a highly important service function for cities!
- Third highest position after emergency and public transport
- Reserved zone at road edges for delivery and pick-up of commercial goods

What’s needed?

- Installation of loading zone with clear signs
- Parking and stopping should be prohibited
- Controlling of parking and stopping - continuously!
- But a low cost solution
Truck Routing System

- Designated routes for trucks in specified streets to avoid HDV traffic in residential areas
- Combining with navigation based information for freight/logistics operators (e.g. in Dundee)

Source: Stadt Dortmund, Stadtplanungs- und Bauordnungsamt and Stadt Hamm, Stadtplanungsamt - Verkehrsplanung
Toll for heavy trucks

- “Internalisation” of external costs
- All lorries (from 7,5 t) on German motorways and federal roads

Abrasion (vibration) of roads by lorries

1 lorry (24 t) = 10,000 cars (1,4 t)

- German toll fee: ~ 15 Ct/km
- UBA: toll price should be 23,5 Ct/km higher including all environmental costs: ~ 40 Ct/km
City Logistic

- Suppliers try to bundle their deliveries
- Intra-company and in networks
- Inter-company as supplier or sender cooperation
- First CL models in 1990's failed due to the competition and high coordination demand which were setting barriers of cooperation for companies on the same level of the supply chain
- Barriers decreasing since full digitalisation of the information flow of the supply change: City logistic 2.0
- But transactions cost for the delivery companies
- Municipalities have to set a supporting framework including restrictions to promote supplier cooperation
Cooperation during construction period – Exp. Berlin Potsdamer Platz

- Huge amount of transport material had to be moved to and away from the building site ground
  - excavation: 6 Mio. t
  - construction waste: 200,000 t
  - groundwater: 14 Mio. m³
  - concrete: 1.7 Mio m³
  - cargo: 2 Mio. t

- Big challenge to organise this transport in the centre of a capital like Berlin

- A centralised construction logistics management was created as a Public-Private-Partnership (named: baulog)

- Controlled all commercial transports (delivery and waste disposal) of the building site

- Railway and inland navigation
Results

- Prognosis: 42,000 additional lorry km/day
- Due to the baulog concept mileage reduced to 1,300 lorry km/day
- 80% railway & inland navigation
- Relieved the inner-city road network
- Avoided noise and pollution to residents
- Building project was completed half a year earlier
- Additional cost for baulog reduced after three months
Transport concept today

- High accessibility with different transport types
- Berlin Potsdamer Platz area accessible on different levels
  1. level (surface): streets, pavements, bike lanes; buses and taxis
  2. level (underground): railway and subway connection to city and regional public transport network
     transit car traffic in a road tunnel
- Restricted car traffic in the area
- Parking houses at the periphery of the area only
Delivery goods

- 2 underground docking stations for goods delivery at road tunnel
- Provide 110 shops, 30 restaurants, 2 cinemas, hotels and offices
- Underground delivery stations in a determined logistic regiment
- Shippers could book time slots of 15 min at one of 15 ramps
- 170 to 180 lorries use this station each day from 5 a.m. until 9:30 p.m.

- High investment costs: only a solution for inner city areas with a high lorry demand
Exp. Freight villages / Urban logistic centre concept Berlin

Logistic locations in the agglomeration of Berlin

**Yellow**: main industrial areas
- **Freight villages** on the edge of the city with connection to rail, road and waterways
- **Freight sub-centres** on the inner urban rail network

→ the use of sub-centres and rail is low, because there are not many incentives to use it and low restrictions for using roads and lorries
Legal framework of implementation

1. **Justification link**
   ▲ List of the urban quality goals and necessary measures intended
   ▲ Representation of the connection between the quality goals and the planned measures

2. **Integration in urban development concept**
   ▲ Concept should contain:
     • Temporal and local realisation steps
     • Impact assessment of the measures
     • Catering legitimate interests of parties concerned (residents, local enterprises)
     • At first implementation of measures with high probability of success

3. **Decision of the city council**
   ▲ Positive decision of the responsible committee regarding the concept

Arndt, Sommer 1998
Part IV – Champion City Presentation
City of Dundee

- Providing experience, insights and knowledge about their activities on UFT involvement in relation to SUMPs
- Sustainable Urban Logistics Plan for Dundee
Selection of main solutions in UFT and preparation of working group

• Each participant chooses 3 main problem solutions
• 3 highest ranked topics will be discussed in the following 3 working groups.

→ *UFT solutions pin wall with ranking*
Part V – Working groups: case studies

Each participant should choose one working group; probably the group with the topic of most interest for them. The trainer will give an introduction to the group and explain that every group has to create a “case study” of a problem and solution pair.

The tasks in the groups are:

• What is the solution (set)?
• What are the problems which could be solved with this/these solution(s)?
• Who are the involved stakeholders?
• What are success factors of the implementation of the solution?
• What is the role of the municipality?
• How could this measure be integrated in SUMP?
Part VI – Results of working groups and wrap-up & outcomes

• One member of each group should introduce the audience to the case study of the group in 5 Mins

• Can use flip charts

• In the residual time of this part:
  - summary (last slide section) and
  - the participants’ evaluation
Actions fields of municipalities to reduce traffic in delivery

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<tr>
<td><strong>Lectures, Studies, Brochures, Webinar etc.</strong></td>
<td></td>
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<tr>
<td>ELTIS</td>
<td>Urban freight/city logistics</td>
<td>Website</td>
<td><a href="http://www.eltis.org/topics/urban-freightcity-logistics">www.eltis.org/topics/urban-freightcity-logistics</a></td>
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<tr>
<td>CIVITAS WEBINAR</td>
<td>Making urban freight logistics more sustainable from theory to practice</td>
<td>Webinar</td>
<td><a href="http://www.youtube.com/watch?v=SQX0rlC7Y1Y">www.youtube.com/watch?v=SQX0rlC7Y1Y</a></td>
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<tr>
<td>Inner urban freight transport and city logistics</td>
<td>Presentation on theme inner urban freight transport and city logistics. EU-funded urban transport research project results on <a href="http://www.eu-portal.net">www.eu-portal.net</a> TRANSPORT TEACHING. 2003</td>
<td>Webinar</td>
<td><a href="http://slideplayer.com/slide/4695906">slideplayer.com/slide/4695906www.eu-portal.net</a></td>
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The CIVITAS Initiative is co-financed by the European Union.
# Available training materials

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<tbody>
<tr>
<td>CiViTAS</td>
<td>Urban freight logistics</td>
<td>Website</td>
<td><a href="civitas.eu/measures/urban-freight-logistics">civitas.eu/measures/urban-freight-logistics</a></td>
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<tr>
<td>BESTUFS</td>
<td>EUROPA - Best Urban Freight Solutions</td>
<td>Website</td>
<td><a href="www.bestufs.net">www.bestufs.net</a></td>
</tr>
<tr>
<td>BESTFACT</td>
<td>A portal of freight transport best practices, contacts and policies.</td>
<td>Website</td>
<td><a href="www.bestfact.net/category/urban-freight">www.bestfact.net/category/urban-freight</a></td>
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<tr>
<td>Cargohopper</td>
<td>Good examples of Green Logistic with consolidation of shipments</td>
<td>Video</td>
<td><a href="www.youtube.com/watch?v=4xTUMAbBpC4">www.youtube.com/watch?v=4xTUMAbBpC4</a></td>
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<tr>
<td>Micro-consolidation</td>
<td>Description of the (Micro)-consolidation solution for last mile delivery</td>
<td>Website</td>
<td><a href="novelog.eu">novelog.eu</a></td>
</tr>
</tbody>
</table>
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http://www.difu.de arndt@difu.de Tel.: 030 39001 - 252

Städtischer Wirtschaftsverkehr - Commercial/Goods Transportation in Urban Areas - Transports Commerciaux/Marchandises en Ville (Deutsch / English / Francais)

https://difu.de/publikationen/2013/staedtischer-wirtschaftsverkehr-commercial-goods.html

https://difu.de/publikationen/2016/commercial-transport-in-urban-areas.html
Abbreviations

UFT = Urban Freight Transport
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CEP = Courier, Express, Package Services
HDV = Heavy Duty Vehicles
Sources


PWC 2017: Aufbruch auf der letzten Meile – Neue Wege für die städtische Logistik, pwc Deutschland 2017, https://www.pwc.de

Bentobox: http://www.bentobox-berlin.de/citylog-projekt/


Marinov, Marin; Federico Giubilei; Mareike Gerhardt; Tolgahan Özkan; Evgenia Stergiou; Mihaela Papadopol; Luis Cabecinha: Urban freight movement by rail, Journal of Transport Literature, Online version, vol.7 no.3 Manaus July 2013, http://dx.doi.org/10.15910/S2238-10312013000300005