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Mechanics of the seminar

- The webinar is being recorded, the URL will be sent out to participants and posted at [www.coe-suhs.org](http://www.coe-suhs.org)
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  - Use Adobe Connect to receive the audio (PRIMARY method)
  - Dial 1-888-446-7584, access code 1120583
- International participants can:
  - Use Adobe Connect to receive the audio (PRIMARY method)
  - Use Skype or similar to dial 1-888-446-7584, code 1120583
  - Dial 212-372-3742 (caller paid call)
- Submit questions using the Chat feature

Now offering Professional Development Hours

- Professional Development Hours (PDH) for Professional Engineers (PE) now available
  - 1.0 PHD for this webinar
- Credits issued through the NYS Department of Education. Please confer with the state or country in which you register as a PE to determine whether or not the credit will transfer.
- For more information on obtaining PDH please email wojtoj@rpi.edu
CoE-SUFS

- Funded by the Volvo Research and Educational Foundations (VREF)
- Main Goal: To jumpstart an integrative process, involving cities, private sector, and researchers to develop new freight systems paradigms that:
  - Are sustainable
  - Increase quality of life
  - Foster economic competitiveness and efficiency
  - Enhance environmental justice
CoE-SUFS Dissemination Programs

- **Peer-to-Peer (P2P) Exchange** to share global best practices and real world examples of sustainable urban freight systems

- **Next P2P (August, 2015):**
  - Cargo Cycles for Urban Freight: The American Experience

- **Workshops** to bring together public/private sectors and academia, to jointly work to address urban freight issues
  - Already held at: India, Brazil, Colombia, Canada, Mexico, Chile, and Australia

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Cargo Cycles for Urban Freight: The European Experience

Achim Beier  
(messenger Transport+Logistik)

Johannes Gruber  
(DLR Institute of Transport Research)

Julius Menge  
(Berlin Senate Department for Urban Development and Environment)
Relevance of cargo cycles for public authorities
Different cities, different sizes, different economic environment...

... but we are all facing the same challenges
(with differences in severity)

Challenges...
- Noise
- Pollution
- Greenhouse gases
- Traffic safety / accidents
- Congestion

But...
- Just building new infrastructure can not cover problems related to urban freight
- (Infrastructural) Measures are difficult to realize within urban areas
- Question of resources ...

Berlin is different...

Surface area: 892 km² / 344 mi²
Inhabitants: approx. 3,450,000
45% of households without a car*
Motorisation: 324 cars/1000 res. *
Employed: 1,700,000 (2011)
Unemployment rate: approx. 11%
Low commuting rate (290,000/150,000)
Polycentric city / short journeys
There are significant negative effects of traffic...

... concentrated esp. to the (less motorized) inner city

Is there *one* simple/single solution?

<table>
<thead>
<tr>
<th>Solution For Loading/Unloading</th>
<th>Consolidation Of Heavy goods</th>
<th>Maintenance For machines</th>
<th>Rail</th>
<th>Barge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>CO2</td>
<td>Nox</td>
<td>PM2.5/10</td>
<td>Cargo Cycles</td>
</tr>
<tr>
<td>Congestion</td>
<td>Parking fees and fines</td>
<td>Night time delivery</td>
<td>Procurement</td>
<td>Green Logistics</td>
</tr>
<tr>
<td>Alternative fuels</td>
<td>Traffic load on Arterial roads</td>
<td>Telematics</td>
<td>Route Planning</td>
<td>Mobility</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dedicated lanes</td>
<td>...</td>
</tr>
</tbody>
</table>
How is urban freight reflected?

- Cause of significant negative effects (pollution, congestion, accidents, ...)
- “I can’t sleep at night” / “Why in my neighbourhood” / “Dangerous” / “Ban them from the inner city…”

⇒ Problems create a pressure to act instead of pro-actively shaping the system together

Result:

- Lack of awareness, lack of general understanding, limited knowledge about requirements of different stakeholder groups
- Politicians, boroughs, local economy, citizens, authorities, lobby groups: opponents or partners?

Approaches: ...

Cargo Cycles in Berlin's commercial transport

- Something new or a renaissance of something old?

Cycling service men at Berlin-Potsdamer Platz in 1906

Source: Missmann 1987, S. 94
The shorter a „last mile“ is, the more „sustainable“ it can get...

Potential and limitations of cargo cycles in urban freight

- Flexibility, much less dependence on traffic load, door-to-door transport
- Reliability (very important issue for urban logistics)
- Low „total costs of ownership“ (TCO), small initial investment (no fuel, if electric minimal costs, low insurance rates, land use for parking is limited, low maintenance costs)
- Drivers license / demographics
- Limitations for weight / volume / distances
- Truly „green logistics“

**Potential from an urban perspective:**

- Locally emission free (CO2, NOX, PM10 and PM2.5, noise), but impact is limited (number of trips vs. trip length)
- Uses existing infrastructure → land use
- Enables modal shift (especially for courier, express and parcel deliveries) and innovative logistics concepts
Legal background

- Cargo cycles are legally classified as bicycles, without or with an electrical assistance of up to 250 Watts
- Maximum width = 1 m; 3- or 4-wheelers even wider
- No regulation concerning payload
- No specific regulation concerning use of road space or bicycle lanes
- Parking on sidewalks is legal (without being an obstacle for others)
- Pedestrian zones: Free for cargo cycles if "free for bikes"; otherwise: pushing your bike is necessary!

Transport market segments with cargo cycle use
Fields of application for cargo cycles

- Mail deliveries
- Service traffic
- Relevant transport market segments
- Courier deliveries
- Internal/own-account transport
- Parcel deliveries
- Home deliveries

Results of an ongoing research project conducted by DLR Institute of Transport Research.
Funding by the German Federal Ministry of Transport and digital Infrastructure.

not taken into account:
- private mobility
- transport of people
- mobile sales stalls

Mail deliveries
Courier deliveries

Parcel deliveries
Home deliveries

Internal/own-account transport
Service traffic

Cargo cycles and city logistics
Cargo cycles as part of city logistics schemes

London: Micro-consolidation center for office supply deliveries

Hamburg: Mobile depot

Brussels: Mobile depot

Paris: Urban freight by barge and cargo cycles

Berlin: Cooperation - The EU project CityLog
Is it that what we want?

CityLog: The Process
Hands-on perspective: *messenger*, a courier company

*Messenger, a courier company* (est. 1989)

- Basic philosophy: Sustainable logistics!
- Types of service: City logistics, Express deliveries national/international
- Several types of vehicles:
  - Branches in 5 German cities, HQ: Berlin
  - Cooperative system with freelance messengers
- Some achievements:
  - First CMC (Cycle Messenger Championships) in 1993
  - “Berlin rides bike” in 1995
  - “Location of ideas” in 2009
  - Pioneers of cargo bikes ...

*Achim in 1989*
Cargo cycles: Usual vehicle for messengers

Beginnings around 1900

"Long John" since 1930s

2007 2009 2012

Loading capacity of cargo cycles

8 shoe boxes
4 copy paper boxes
1 packing case...

1 pallet

...25 shoe boxes...

...or even more...
'I replace a car':
Results from a two-year demonstration project
2012-2014

Main vehicle: *iBullitt Pedelec* (x40)

- 250 Watts engine
- Payload: 100 kg (220 pounds)
- Cargo box volume: 200 l (0.18 freight tons)

Additional vehicle: *CargoCruiser* (x1)

- 250 Watts engine
- Payload: 300 kg (660 pounds)
- Cargo box volume: 900 l (0.8 freight tons)

Participating courier companies:

- Funding by the German Federal Ministry for the Environment
‘I replace a car’: Cargo cycle usage

<table>
<thead>
<tr>
<th>Number of shipments by cargo cycles</th>
<th>Share of all shipments of courier companies</th>
<th>Mean shipment distance (cargo cycles)</th>
<th>Total mileage (cargo cycles)</th>
<th>Share of total mileage of all vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>119,000</td>
<td>7.5%</td>
<td>3.9 km</td>
<td>455,000 km</td>
<td>4%</td>
</tr>
</tbody>
</table>

‘I replace a car’: Shipment distance and mileage

**Shipment distance**

- Bicycle: 0-2 km, 2-4 km, 4-6 km, 6-8 km, 8-10 km, 10-12 km, 12-14 km, 14-16 km, 16-18 km, 18-20 km
- Cargo cycle: 0-2 km, 2-4 km, 4-6 km, 6-8 km, 8-10 km, 10-12 km, 12-14 km, 14-16 km, 16-18 km, 18-20 km
- Car: 0-2 km, 2-4 km, 4-6 km, 6-8 km, 8-10 km, 10-12 km, 12-14 km, 14-16 km, 16-18 km, 18-20 km
- Small van: 0-2 km, 2-4 km, 4-6 km, 6-8 km, 8-10 km, 10-12 km, 12-14 km, 14-16 km, 16-18 km, 18-20 km
- Large van: 0-2 km, 2-4 km, 4-6 km, 6-8 km, 8-10 km, 10-12 km, 12-14 km, 14-16 km, 16-18 km, 18-20 km

**Daily mileage**

- Bicycle: 0-26 mi, 26-52 mi, 52-78 mi, 78-104 mi, 104-130 mi, 130-156 mi, 156-182 mi, 182-208 mi, 208-234 mi, 234-260 mi
- Cargo cycle: 0-26 mi, 26-52 mi, 52-78 mi, 78-104 mi, 104-130 mi, 130-156 mi, 156-182 mi, 182-208 mi, 208-234 mi, 234-260 mi
- Car: 0-26 mi, 26-52 mi, 52-78 mi, 78-104 mi, 104-130 mi, 130-156 mi, 156-182 mi, 182-208 mi, 208-234 mi, 234-260 mi
- Small van: 0-26 mi, 26-52 mi, 52-78 mi, 78-104 mi, 104-130 mi, 130-156 mi, 156-182 mi, 182-208 mi, 208-234 mi, 234-260 mi
- Large van: 0-26 mi, 26-52 mi, 52-78 mi, 78-104 mi, 104-130 mi, 130-156 mi, 156-182 mi, 182-208 mi, 208-234 mi, 234-260 mi

n ~ 1.2 million

n ~ 89,000
'I replace a car': Car substitution potential

Share of trips below 10km & transportable goods (ex-ante data)

- Substitutable deliveries: 42%
- Substitutable mileage: 19%

Share of trips below 10km & transportable goods

Substitutable deliveries

Substitutable mileage

'I replace a car': Change in modal split

Shipments

- Vans: 9%
- Bicycles: 8%
- Cargo: 9%
- Cars: 35%

Mileage

- Vans: 13%
- Bicycles: 9%
- Cargo: 54%
- Cars: 52%

Inner ring: before project (May 2011-June 2012) ~ 1.1 million obs.
Outer ring: during project (July 2012-March 2014) ~ 1.6 million obs.
"I replace a car": Characterization of messengers

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Type of vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bicycle</td>
</tr>
<tr>
<td>n (t1 survey 2014)</td>
<td>48</td>
</tr>
<tr>
<td>Age Ø</td>
<td>39 years</td>
</tr>
<tr>
<td>Gender: male</td>
<td>90%</td>
</tr>
<tr>
<td>Education: high (Abitur)</td>
<td>74%</td>
</tr>
<tr>
<td>Income</td>
<td>Below 500 €</td>
</tr>
<tr>
<td></td>
<td>2500 € and more</td>
</tr>
<tr>
<td>Job organization</td>
<td>Working as messenger only</td>
</tr>
<tr>
<td></td>
<td>Working hours per week Ø</td>
</tr>
<tr>
<td></td>
<td>Using only one type of vehicle</td>
</tr>
</tbody>
</table>

n=63

<table>
<thead>
<tr>
<th>Agreement</th>
<th>t0</th>
<th>Agreement</th>
<th>t1</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Using electric cargo cycles in my city makes sense.&quot;</td>
<td>84%</td>
<td>94%</td>
<td></td>
</tr>
<tr>
<td>&quot;Electric cargo cycles will generally be successful in courier services.&quot;</td>
<td>48%</td>
<td>62%</td>
<td></td>
</tr>
<tr>
<td>&quot;There is plenty of information available on electric cargo cycles.&quot;</td>
<td>36%</td>
<td>42%</td>
<td></td>
</tr>
</tbody>
</table>

"I replace a car": Factors influencing cargo cycle acceptance of individual messengers

Dependent variable: Rejection of electric cargo cycles
Data: 2 survey among messengers, before and at the end of the field test

<table>
<thead>
<tr>
<th>Variable</th>
<th>M1</th>
<th>M2</th>
<th>M3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.056</td>
<td>0.042</td>
<td>0.048</td>
</tr>
<tr>
<td>Gender: female</td>
<td>1.359</td>
<td>1.631</td>
<td>0.991</td>
</tr>
<tr>
<td>Net. income: &gt;€2000</td>
<td>1.036</td>
<td>0.957</td>
<td>0.702</td>
</tr>
<tr>
<td>Education: low/medium</td>
<td>0.628</td>
<td>0.497</td>
<td>0.424</td>
</tr>
<tr>
<td>Car ownership</td>
<td>0.759</td>
<td>0.549</td>
<td>0.777</td>
</tr>
<tr>
<td>Possibility to bundle shipments</td>
<td>-0.797</td>
<td>-0.723</td>
<td>0.007</td>
</tr>
<tr>
<td>Interest in vehicle technology</td>
<td>-1.621</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>&quot;I totally agree that electric cargo bikes attract onlookers' interest.&quot;</td>
<td>-1.272</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Experience with cargo bikes</td>
<td>-1.358</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>3.315</td>
<td>-2.725</td>
<td>-0.508</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-214</td>
<td>-204</td>
<td>-176</td>
</tr>
<tr>
<td>Pseudo R² (McFadden)</td>
<td>0.125</td>
<td>0.165</td>
<td>0.279</td>
</tr>
</tbody>
</table>
Factors influencing companies' decisions to use cargo cycles

<table>
<thead>
<tr>
<th>Environmentally specific factors</th>
<th>Company-specific factors</th>
<th>Vehicle-specific factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Regulative framework conditions</td>
<td>• Type of fleet decision-making</td>
<td>• Compatibility with transport tasks</td>
</tr>
<tr>
<td>• Socio-spatial context</td>
<td>• Companies' strategic orientation</td>
<td>• Relative advantage/disadvantage compared to conventional vehicles</td>
</tr>
<tr>
<td>• Economic framework</td>
<td>• Individual attitudes of decision makers</td>
<td>• Availability (trialability) of cargo cycles</td>
</tr>
</tbody>
</table>

Results of an ongoing research project conducted by DLR Institute of Transport Research
Funding by the German Federal Ministry of Transport and digital Infrastructure
Closing Remarks

- It’s still a long way to go...
- ...but: cargo cycles have been proven as an established element of urban freight in various European cities
- Market for cargo cycles / cargo cycle deliveries is growing
- Analysis of user acceptance is crucial
- What do we need: (some examples)
  - Awareness of the topic and the different interest groups
  - Sufficient data
  - Partners for the process
  - Clear responsibilities
- Statistics are missing, calculating potentials is an option, but local impact differs → discussion and research is needed
- First projects delivered real and relevant data, not just for cities, but especially for companies
- Perfect potential for synergetic effects between private and commercial bicycle use (e.g. investments into cycling infrastructure)
Do you want to know more?

cyclelogistics.eu (English)  
lastenrad.vcd.org (German)

Publications:


... or ask us!

Thanks from Berlin!
Questions?

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