TU Dortmund University

Faculty of Spatial Planning

CARGO BIKES AS TRANSPORTATION VEHICLES FOR URBAN FREIGHT TRAFFIC

Study on European business examples to estimate the parameters and potentials for German cities

MASTER THESIS

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SYNOPSIS

Master Thesis

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Cargo bikes as transportation vehicles for urban freight traffic

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Preface

Urban freight traffic is of increasing interest for urban planning. It is a substantial part of urban traffic and therefore takes part on the negative impacts of traffic on the urban environment. Alternative transport vehicles are needed to create a low emission and efficient urban freight traffic, as desired by national development goals. This master thesis on “Cargo bikes as transportation vehicles for urban freight traffic” reveals the possibilities to use cargo bikes in urban freight traffic by reference to European business examples. Moreover it names the parameters of cargo bike use.

This is a short version of the master thesis, showing the main insights of the study. The master thesis itself is done in German.

At this point I would like to thank all contact persons, which provided me with important information on their businesses, areas of deployment or supported me by their expertise on cargo bikes.

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Thematic Background

The official statistics in Germany conceive freight traffic merely since about ten years. A spatially differentiated view is hardly possible. Nevertheless the existing statistics illustrate that the level of motorisation is very high and the car is the most used vehicle. Urban freight traffic is hardly acquirable due to its complexity and its spatially differing structures. Yet it can be shown that especially in big metropolitan regions public transport is of higher importance for private transportations. This leads to a higher amount of freight traffic. Those effects are intensified in the centre of big metropolitan regions like Hamburg, Munich or Berlin, where freight traffic can take up to more than 50 % of all traffic during daytime (London, Paris approximately more than 90 %) (cf. Kutter 2004: 19). In urban freight traffic up to 3.5 t, especially the urban retail sector, the manufacturing sector, Courier-, Express- and Postal services, craftsmanship, services and the hospitality industry are of importance. The urban retail sector is currently characterised by ongoing changes. Deliveries are increasing due to rising rental prices, which leads to the conversion of storage space to sales areas (cf. VCD 2006: 52). The centre of cities, in Logistics mostly referred to as "last mile" is becoming a special challenge for the stakeholders of urban freight traffic. „The last mile is currently regarded as one of the more expensive, least efficient and most polluting sections of the entire logistics chain. (...) The fact that a substantial proportion of home deliveries are performed by van (...) translates into higher emissions per parcel as compared to delivery by truck" (MACHARIS u. MELO 2011: 56). The high level of motorisation and the rising numbers of deliveries lead to increasing environmental problems for cities. In Germany almost 40 % of all CO_2-Emissions on the streets are related to urban traffic. The main reason for that is, that the driving cycle in the city is very irregular, therefore the fuel consumption is higher (cf. PULS 2008). The negative effects of freight traffic on urban construction, environment and traffic can be seen in every city in mostly the same form: High specific emissions by heavy trucks, illegal and obstructive parking, not observance of delivery time lines in the city centres and more (cf. Kutter 2004: 28). At the same time there are effects of the city structure on the urban freight traffic. The goal of national urban development policies in Germany is to enforce and improve the quality of the inner city structures. Therefore the inner city deliveries play an important role.

More about that in Part A of the master thesis

Cargo bikes

Already at the end of the 19th century cargo bikes played an important role in the deliveries of European cities. There is no statistical data on the current usage of cargo bikes in Europe. The research for this thesis reveals a broad range of cargo bike types. 67 models from 34 manufacturers could be detected, with only bikes looked at being capable of at least 50 kg payload and suitable for commercial use.

There are two-, three- and four-wheel cargo bikes, which differ in their design and can be cateogrised as bakery or postal bikes, low-loader and backpacker.

Bakery bikes are much alike conventional bikes. They are equipped with a larger loading area in front of the handlebar and sometimes a second loading area in the rear. They only have two wheels and mostly a small payload up to 75 kg. Single models are capable of up to 150 kg payload.

Low-Loaders are equipped with a loading area, which is located as low as possible between the front wheel and the head tube. This increases the stability of the cargo bike and higher amounts of cargo can be transported. Two-wheel low-loader can carry up to around 180 kg, three-wheel low-loader are capable of up to 500 kg.

Backpackers do almost have the same principle in design like the low-loaders, only the loading area is located in the rear, behind the driver. This leads to the advantage that transported goods cannot block the field of view of the driver. Two-wheel backpackers can load up to 200 kg, three-wheel backpackers up to 250 kg. The identified four-wheel cargo bikes are all backpackers. They are capable of up to 400 kg.

There is a brought range of different cargo bikes. Depending on the construction, the design and the used materials they differ for example in weight, payload and also driveability. Numerous cargo bikes have an optional or a standard electric assistance. Moreover there are models for two drivers. The prices of the researched cargo bikes range from ca. 700,00 € to ca. 10.000 €.

Consequently there are various possibilities for the usage of cargo bikes. Looking on the payloads and the insights on urban freight traffic they are suitable for the urban retail sector, Courier-, Express- and Postal services, catering, craftsmanship, the manufacturing sector and services of all kinds. Moreover municipal maintenance services are possible users. Inner factory traffic was not regarded in this thesis.

More about that in Part B of the master thesis

Bakery Bikes

Filibus (Kemper Fahrradtechnik, DE)
Weight: 21 kg
max. payload: 75 kg
max. total weight: 250 kg
Size loading area: L 72 x B 37 cm
Size cargo bike: L 200
Electric assistance: no
Basic price: 1.320,00 €

Low-Loader

Bullitt (Larry vs. Harry, DK)
Weight: 24-32 kg
max. payload: 180 kg
max. total weight: 210 kg
Size loading area: L 71 -78,7 x B 46,6 cm
x H 26,7-37,2 cm
Size cargo bike: L 245 x B 59 cm
Electric assistance: no
Basic price: 1.953,00 € - 2.821,00 €

Backpacker

MCS Truck (Maderna Cycle Systems, AT)
Weight: 29 kg
max. payload: 150 kg
max. total weight: 250 kg
Size loading area: L 60 x B 60 cm
Size cargo bike: L 200 x B 60 cm
Electric assistance: no
Basic price: 1.999,00 € - 2.416,00 €

Picture 1: Examples for 2-wheel cargo bikes. Source pictures and numbers: Manufacturer.

Low-Loader

Christiania (Christiania Bikes, DK)
Weight: 35 kg
max. payload: 150 kg
max. total weight: -
Size loading area: L 88 x B 62 x H 36-50 cm
Size cargo bike: L 208 x B 85 cm
Electric assistance: optional
Basic price: 1.289,00 € - 4.250,00 €

Backpacker

Cycles Maximus Cargo Trike
(Cycles Maximus, UK)
Weight: 54-85 kg
max. payload: 250 kg
max. total weight: 335 kg
Size loading area: L 123 x B 90 x H 94 cm
Size cargo bike: L 260 x B 120 cm
Electric assistance: optional
Basic price:3.070,00 € - 5.115,00 € + VAT

Cyclo Cargo (Cyclopolitain Vehicules, FR)
Weight: 129 kg
max. payload: 250 kg
max. total weight: 340 kg
Size loading area: 1,5 m³
Size cargo bike: L 265 x B 100 cm
Electric assistance: yes
Basic price: 7.000,00 €

Picture 2: Examples for 3-wheel cargo bikes. Source pictures and numbers: Manufacturer.

Backpacker

Cargo „The Van“ (Work-Bikes, DE)
Weight: 125 kg
max. payload: 250 kg
max. total weight: -
Size loading area: 1,2 m³
Size cargo bike: L 291-309 x B 120 cm
Electric assistance: optional
Basic price: 5.780,00 € zzgl. Steuer

Pick Up (Vrachtfiets, NL)
Weight: 150 kg
max. payload: 400 kg
max. total weight: -
Size loading area: L 200 x B 95 x H 40 cm
Size cargo bike: L 300-320 x B 110 cm
Electric assistance: yes
Basic price: -

Picture 3: Examples for 4-wheel cargo bikes. Source pictures and numbers: Manufacturer.

Current usage of cargo bikes in Europe

Especially in countries with extensive bicycle use, for example in Denmark or the Netherlands, a consciousness for cargo bikes can be detected. Nevertheless cargo bikes are mainly used in private. Through this study 38 businesses and project examples in Europe, that use cargo bikes for commercial reasons, were detected. They are concentrated in a small number of countries. Most of the examples could be found in Great Britain, Belgium, Austria, Spain and Germany. Looking on the locations it can be stated that the examples operate in big city (>100.000 inhabitants), with mostly only a slightly hilly topography.

Most of the companies are small businesses, with a small number of employees and a small number of cargo bikes. Moreover the cargo bike mostly is not the single transportation vehicle. Nevertheless the majority of the detected companies only use non motorised vehicles.

The CEP-Sector is the main area of deployment among the examples. Also of importance is the general transport of varying goods. As the examples show, the areas of deployment can be diverse. Among the CEP and Transport branch, the examples could be ascribed to Logistics, catering, retail, craftsmanship, municipal and other services, as well as promotion and advertisement. Most of the examples work in numerous areas. Around 45 % concentrate on one branch.

The areas of deployment show that the usage of cargo bikes covers more than CEP-Services. It exploits own sections of the urban freight traffic. The European examples draw a uniform appearance: transportation is not limited to certain types of goods; it covers, except for single legal restrictions, all type of goods; the payload ranges from 50 to 450 kg – most of the examples show a maximum payload of 100-150 kg per bike. The area of deployment is spatially limited; sole distances do mostly not exceed 20 km; in most of the cases cargo bikes are only use in a certain area, mostly the centre of a city. At the most they are used in areas, where the usage of non motorized vehicles is disadvantageous due to traffic jams, missing parking possibilities and legal restrictions.

Apart from single critical utterances, the usage of cargo bikes is evaluated very positive by the business examples. Especially its climate friendly and energy saving effects were stressed out by the companies.

More about that in Part C of the master thesis

The Parameters

The study shows that the usage of cargo bikes for urban freight traffic is affected positively and negatively by varying parameters. Those parameters can be of differing importance to the stakeholders of urban freight traffic. Moreover the stakeholders can influence those parameters in diverse ways.

Cognitive parameters: *Image and Perception of cargo bikes*. The knowledge on the possibilities and potentials of cargo bikes among the stakeholders so far is little and inhibits a comprehensive use of cargo bikes in urban freight traffic. There is no direct influence on those parameters. They are affected through promotion and information.

Structural parameters: *Bicycle friendly infrastructure, limitation of motorized traffic and economically suitable urban structure*. Those parameters differ very much spatially. A bicycle friendly environment is not a guarantee for the successful usage of cargo bikes, but it is an important starting condition.

Legal and socio-political parameters: *legal regulations on usage and manufacturing; legal and social acknowledgement as delivery vehicles.* Legal regulations often have an inhibiting effect in many European countries. There is no consistent regulation for the manufacturing and the usage of cargo bikes in Europe.

Corporate parameters: *Internal adjustment of processes*. The usage of cargo bikes requires adjustment of corporate processes due to the requirements of cargo bikes. At the same time cargo bikes are not suitable for every task. Nevertheless it can develop new areas of deployment.

Macroeconomic parameters: *Market economy presence and strength of cargo bike manufacturers*. The economic presence of cargo bike manufacturers is compared to the automobile industry marginal. A greater industrial production respectively a lobby is needed.

Technical parameters: *Design and Construction of cargo bikes*. Production according to uniform standards and prevention of cheap imports to ensure the quality of cargo bikes.

Physical parameters: *The use of cargo bikes means physical effort*. This limits the use of cargo bikes. By electric assistance this can be overcome to a certain extent.

Currently the most important parameters are the cognitive parameters. Irrespectively of the geographical context those parameters are at this point seen as extremely inhibiting. Good practice examples as well as a comprehensive acknowledgement of cargo bikes by the field of urban freight transport, is needed to overcome the concerns of stakeholders.

More about that in Part C of the master thesis

Conclusion

This master thesis on the possibilities of cargo bikes as transport vehicles for urban freight traffic proofs that throughout Europe cargo bikes are used in various ways for commercial purposes. The share in urban freight traffic is currently marginal and does not exploit existing potentials. Cargo bikes so far are only used in certain niches and by small businesses. Moreover in most of the cases low value goods are transported. Therefore a comprehensive use of cargo bikes for commercial reasons cannot be stated. Nevertheless the detected examples and the insights of this thesis reveal a distinctive potential for urban freight traffic, even for high value products. International studies confirm that.

The cargo bike is a suitable transportation vehicle for the transport of goods, especially on the last mile. The experience of the business examples indicate that the actual payload depends on the transportation purpose, the area of operation, the cargo bike type as well as the physical fitness of the driver.

A comprehensive usage that can lead to an easing of inner city areas, above all needs the action of all stakeholders of the urban freight traffic, with companies and municipalities leading the way. Moreover the cargo bike has to be acknowledged also on a national level for concepts and actions in the development of urban freight traffic.

The importance of cargo bikes in the future is linked strongly to the urban development dynamics and policies. In respect of current developments in urban freight traffic and the slow-moving shift of transportation processes to sustainable means of transportation, the usage of cargo bikes is less an alternative among others than a logical step to achieve short term and efficient positive changes in urban freight traffic.

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